

**2006 SUSPENSION****Electronic Suspension Control (ESC) - Lucerne****SPECIFICATIONS****FASTENER TIGHTENING SPECIFICATIONS****Fastener Tightening Specifications**

<b>Application</b>	<b>Specification</b>	
	<b>Metric</b>	<b>English</b>
Electronic Control Module Mounting Nut	9 N.m	80 lb in
Front Position Sensor Mounting Nut	9 N.m	80 lb in
Rear Position Sensor Mounting Nut	9 N.m	80 lb in

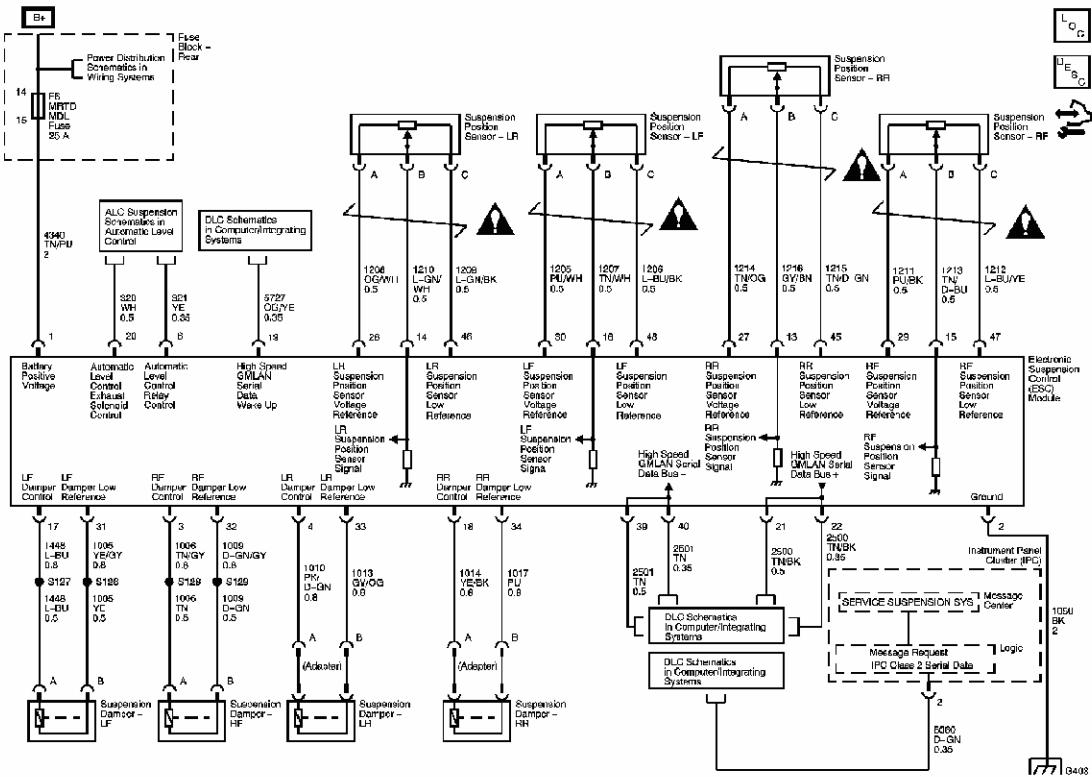
**SCHEMATIC AND ROUTING DIAGRAMS****SUSPENSION CONTROLS SCHEMATIC ICONS****Suspension Controls Schematic Icons**

<b>Icon</b>	<b>Icon Definition</b>
	<p><b>IMPORTANT:</b></p> <p>Twisted-pair wires provide an effective shield that helps protect sensitive electronic components from electrical interference. If the wires were covered with shielding, install new shielding.</p> <p>In order to prevent electrical interference from degrading the performance of the connected components, you must maintain the proper specification when making any repairs to the twisted-pair wires shown :</p> <ul style="list-style-type: none"><li>• The wires must be twisted a minimum of 9 turns per 31 cm (12 in) as measured anywhere along the length of the wires</li><li>• The outside diameter of the twisted wires must not exceed 6.0 mm (0.25 in)</li></ul>

**SUSPENSION CONTROLS SCHEMATICS**

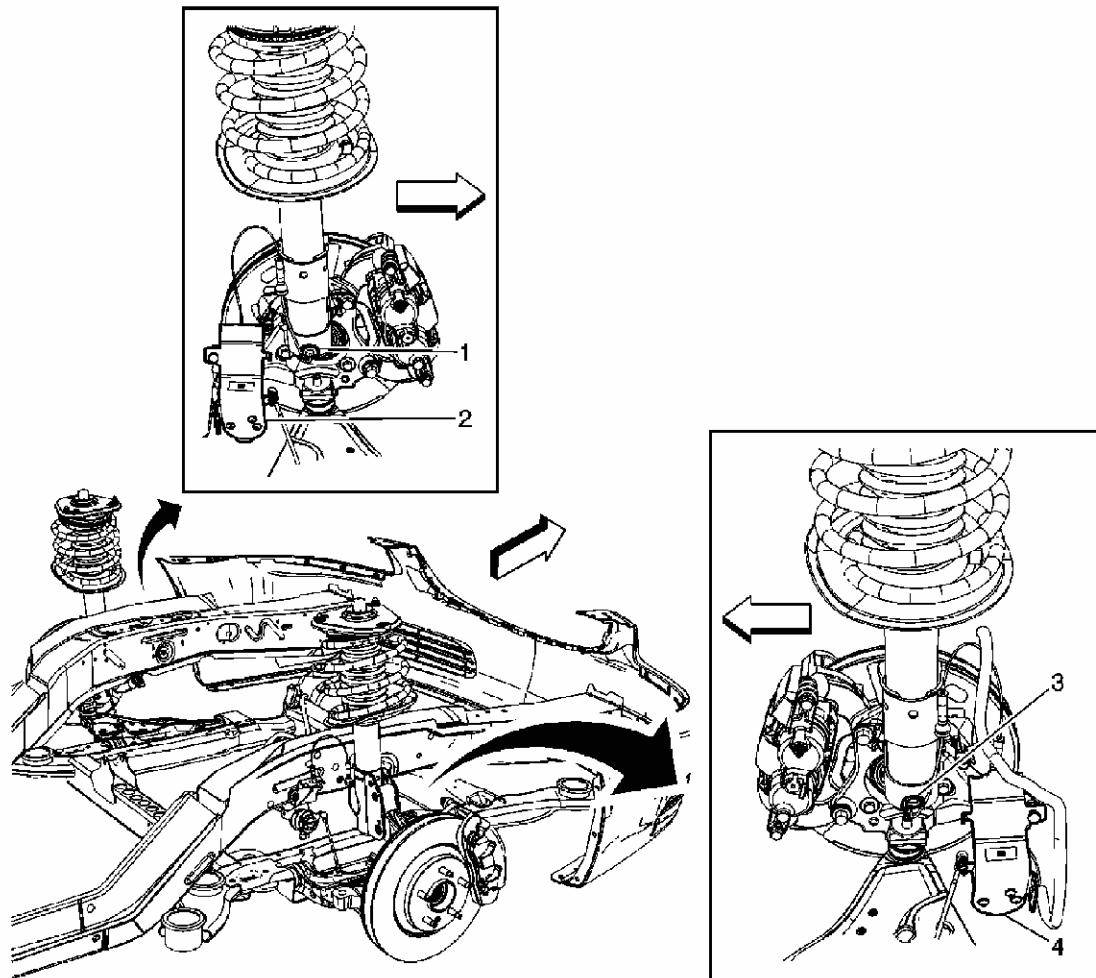
# 2006 Buick Lucerne CXS

## 2006 SUSPENSION Electronic Suspension Control (ESC) - Lucerne



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**Fig. 2: View Of Front Suspension Components**

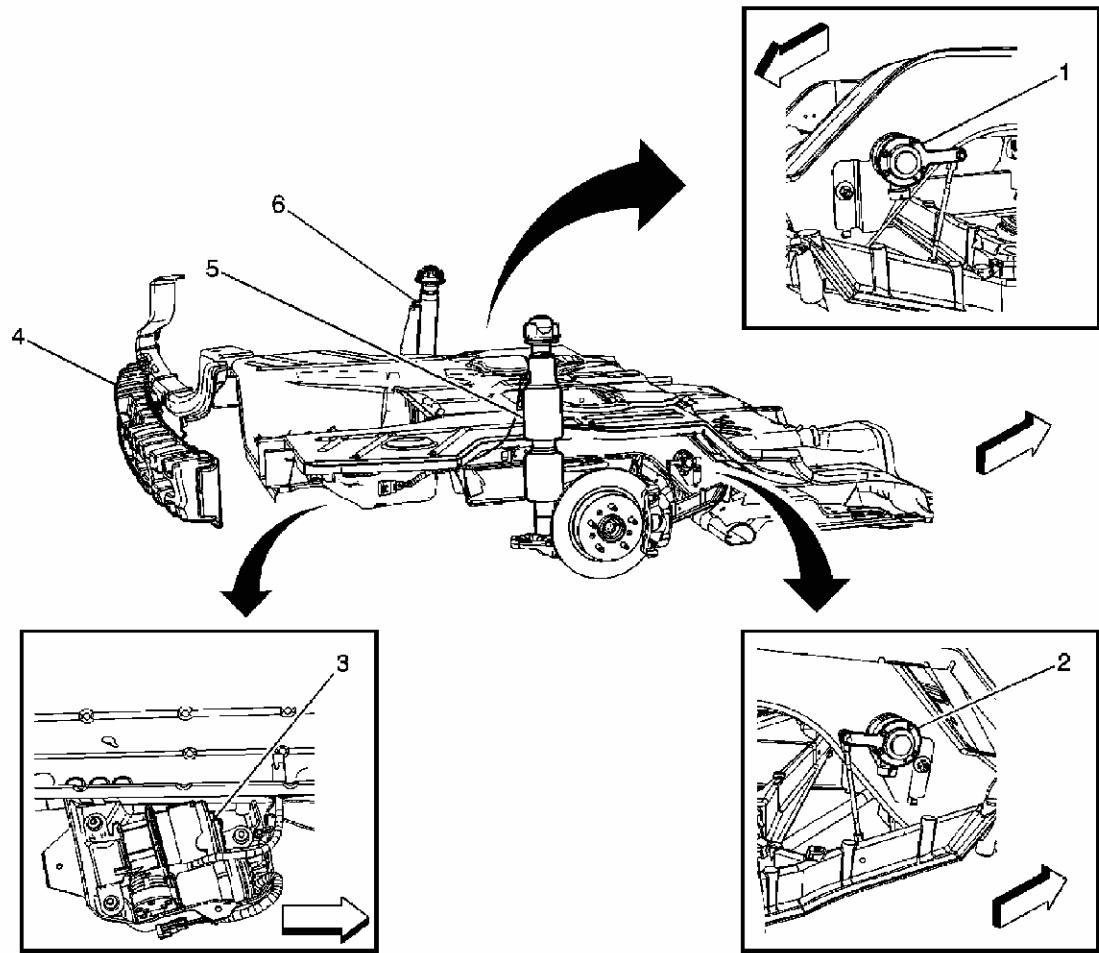
Courtesy of **GENERAL MOTORS CORP.**

### Callouts For Fig. 2

Callout	Component Name
1	Suspension Damper - LF (F55)
2	Suspension Position Sensor - LF (F55)
3	Suspension Damper - RF (F55)
4	Suspension Position Sensor - RF (F55)

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**Fig. 3: View Of Rear Suspension Components**

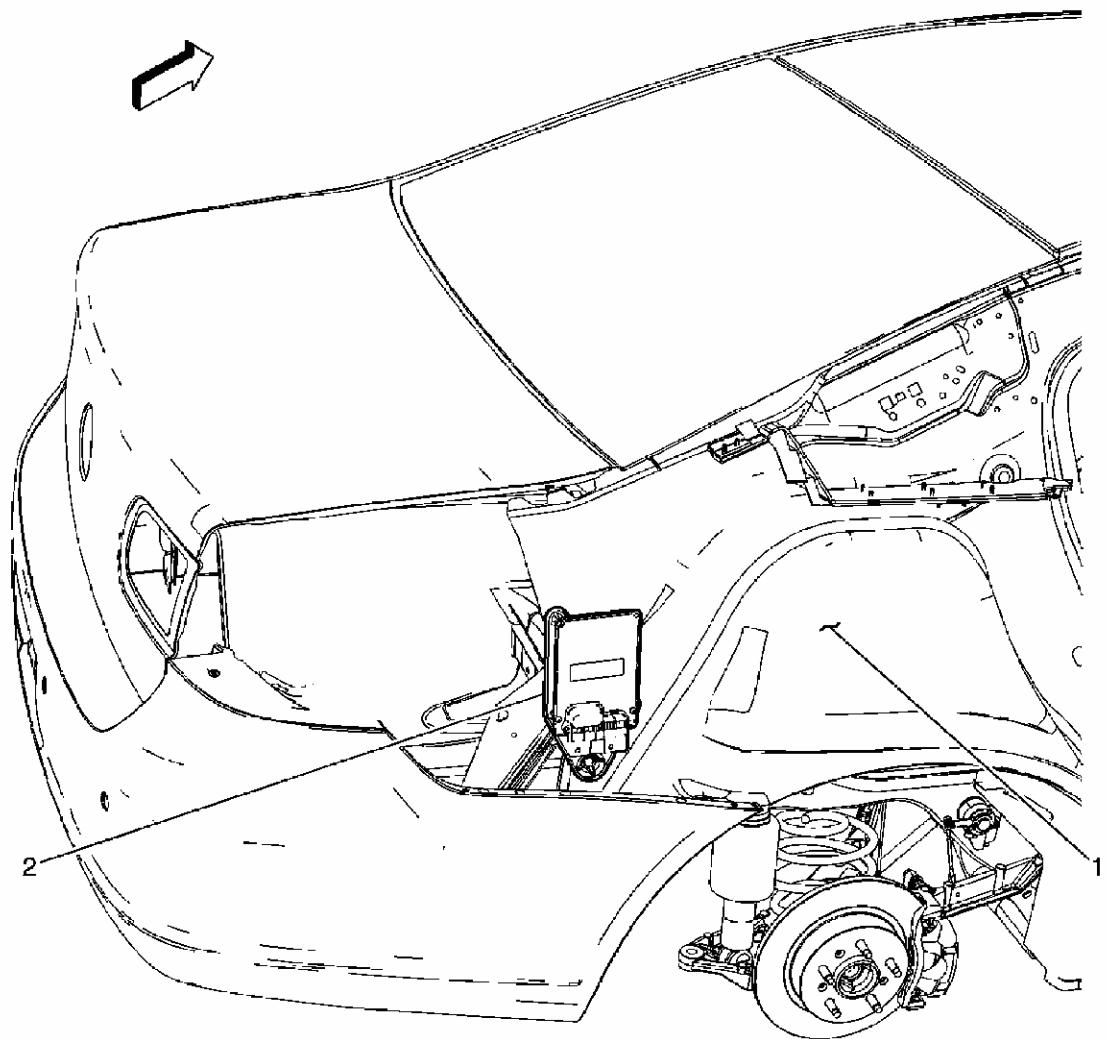
Courtesy of GENERAL MOTORS CORP.

### Callouts For Fig. 3

Callout	Component Name
1	Suspension Position Sensor - LR (F55)
2	Suspension Position Sensor - RR (F55)
3	Automatic Level Control (ALC) Compressor
4	Rear Bumper
5	Suspension Damper - RR (F55)
6	Suspension Damper - LR (F55)

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**Fig. 4: View Behind Right Rear Wheel Well Components**

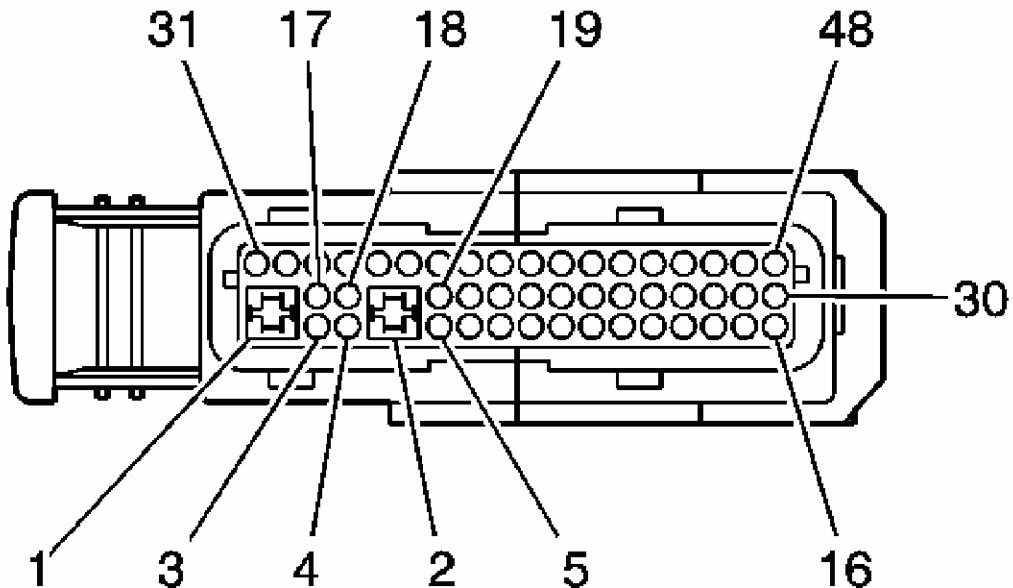
Courtesy of GENERAL MOTORS CORP.

### Callouts For Fig. 4

Callout	Component Name
1	Body Side Inner Panel-Right
2	Electronic Suspension Control (ESC) Module (F55)

### SUSPENSION CONTROLS CONNECTOR END VIEWS

Electronic Suspension Control (ESC) Module (F55)



**Fig. 5: Electronic Suspension Control (ESC) Module (F55) Controls Connector End View**

Courtesy of GENERAL MOTORS CORP.

### Suspension Controls Connector End Views

#### Connector Part Information

- OEM: 54210060
- Service: 89047158
- Description: 48-Way F DRAD (BK)

#### Terminal Part Information

- Pins: 1, 2
- Terminal/Tray: 60040441/21
- Core/Insulation Crimp: 4/5
- Release Tool/Test Probe: 12093647/J-35616-40 (BU)
- Pins: 6, 19, 22, 40
- Terminal/Tray: 60000611/21
- Core/Insulation Crimp: 8/8
- Release Tool/Test Probe: 15314260/J-35616-2A (GY)

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- Pins: 3, 4, 17, 18, 31, 32, 33, 34, 13, 14, 15, 16, 20, 21, 27, 28, 29, 30, 39, 45, 46, 47, 48
- Terminal/Tray: 60000631/21
- Core/Insulation Crimp: Pins 3, 4, 17, 18, 31, 32, 33, 34 - 2/1
- Core/Insulation Crimp: Pins 13, 14, 15, 16, 20, 21, 27, 28, 29, 30, 39, 45, 46, 47, 48 - See Terminal Repair Kit
- Release Tool/Test Probe: 15314260/J-35616-2A (GY)

### Electronic Suspension Control (ESC) Module (F55)

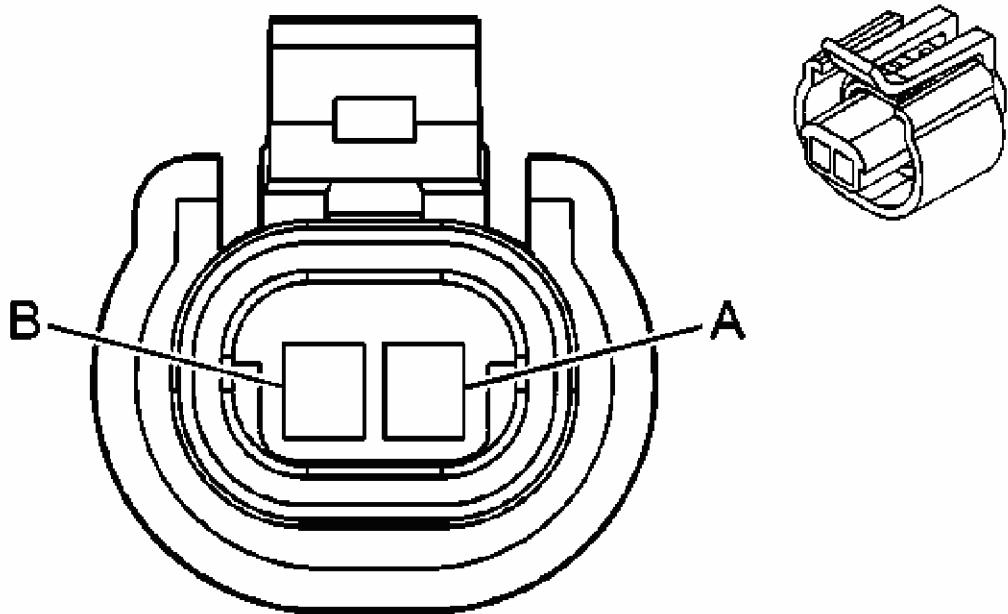
Pin	Wire Color	Circuit No.	Function
1	TN/PU	4340	Battery Positive Voltage
2	BK	1050	Ground
3	TN/GY	1006	RF Damper Control
4	PK/D-GN	1010	LR Damper Control
5	-	-	Not Used
6	YE	321	Automatic Level Control Relay Control
7-12	-	-	Not Used
13	GY/BN	1216	RR Suspension Position Sensor Signal
14	L-GN/WH	1210	LR Suspension Position Sensor Signal
15	TN/D-BU	1213	RF Suspension Position Sensor Signal
16	TN/WH	1207	LF Suspension Position Sensor Signal
17	L-BU	1448	LF Damper Control
18	YE/BK	1014	RR Damper Control
19	OG/YE	5727	High Speed GMLAN Serial Data Wake Up
20	WH	320	Automatic Level Control Exhaust Solenoid Control
21	TN/BK	2500	High Speed GMLAN Serial Data Bus +
22	TN/BK	2500	High Speed GMLAN Serial Data Bus +
23-26	-	-	Not Used
27	TN/OG	1214	RR Suspension Position Sensor Voltage Reference

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28	ORNG	12084	LR Suspension Position Sensor Voltage Reference
29	PU/BK	1211	RF Suspension Position Sensor Voltage Reference
30	PU/WH	1205	LF Suspension Position Sensor Voltage Reference
31	YE/GY	1005	LF Damper Low Reference
32	D-GN/GY	1009	RF Damper Low Reference
33	GY/OG	1013	LR Damper Low Reference
34	PU	1017	RR Damper Low Reference
35-38	-	-	Not Used
39	TN	2501	High Speed GMLAN Serial Data Bus -
40	TN	2501	High Speed GMLAN Serial Data Bus -
41-44	-	-	Not Used
45	TN/D-GN	1215	RR Suspension Position Sensor Low Reference
46	L-GN/BK	1209	LR Suspension Position Sensor Low Reference
47	L-BU/YE	1212	RF Suspension Position Sensor Low Reference
48	L-BU/BK	1206	LF Suspension Position Sensor Low Reference

**Suspension Damper - LF (F55)**

**Fig. 6: Suspension Damper - LF (F55) Connector End View**

Courtesy of GENERAL MOTORS CORP.

**Suspension Controls Connector End Views****Connector Part Information**

- OEM: 15355009
- Service: 15306332
- Description: 2-Way F 150.2 Series Sealed, Pull To Seat (BK)

**Terminal Part Information**

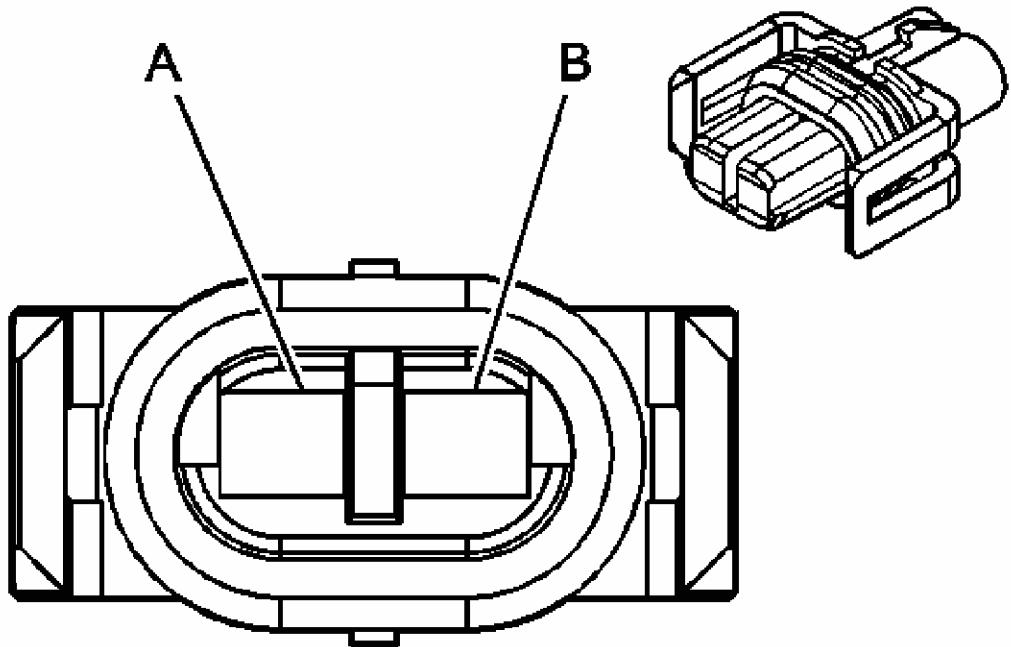
- Terminal/Tray: 12124075/5
- Core/Insulation Crimp: E/C
- Release Tool/Test Probe: 12180559-1/J-35616-2A (GY)

**Suspension Damper - LF (F55)**

Pin	Wire Color	Circuit No.	Function
A	L-BU	1448	LF Damper Control
B	YE	1005	LF Damper Low Reference

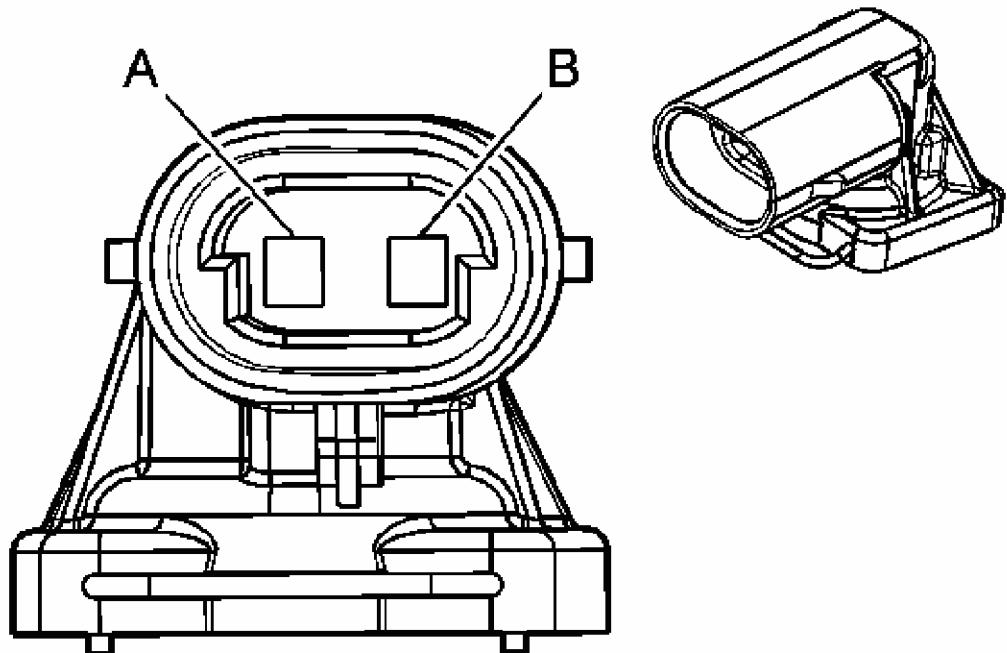
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**Fig. 7: Suspension Damper - LR (F55) Connector End View**

Courtesy of GENERAL MOTORS CORP.



**Fig. 8: Suspension Damper - LR (F55) Connector End View**

Courtesy of GENERAL MOTORS CORP.

### Suspension Controls Connector End Views

#### Connector Part Information

- OEM: 15305168
- Service: 12167117
- Description: 2-Way F Metri-Pack 150 Series (GY)
- Suspension Damper Adapter
- OEM: 15359261
- Service: 88953232
- 2-Way M Metri-Pack 150 Series (GY)

#### Terminal Part Information

- Terminal/Tray: 12048074/2
- Core/Insulation Crimp: E/1
- Release Tool/Test Probe: 12094429/J-35616-2A (GY)

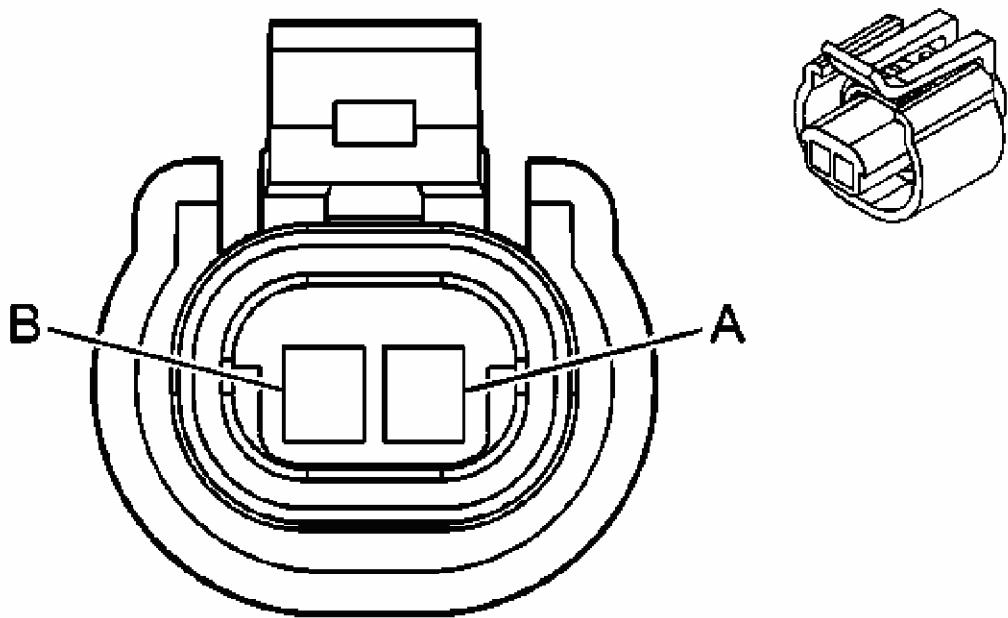
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### Suspension Damper - LR (F55)

Pin	Wire Color	Circuit No.	Function
A	PK/D-GN	1010	LR Damper Control
B	GY/OG	1013	LR Damper Low Reference

### Suspension Damper - RF (F55)



**Fig. 9: Suspension Damper - RF (F55) Connector End View**

Courtesy of GENERAL MOTORS CORP.

### Suspension Controls Connector End Views

#### Connector Part Information

- OEM: 15355009
- Service: 15306332
- Description: 2-Way F 150.2 Series Sealed, Pull To Seat (BK)

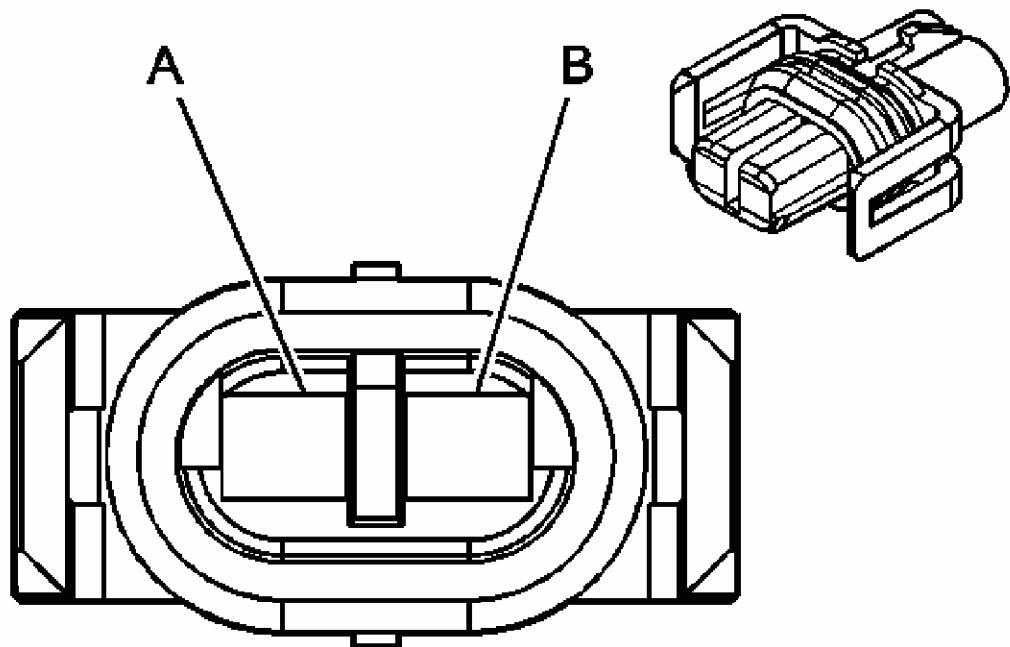
#### Terminal Part Information

- Terminal/Tray: 12124075/5
- Core/Insulation Crimp: E/C
- Release Tool/Test Probe: 12180559-1/J-35616-2A (GY)

**Suspension Damper - RF (F55)**

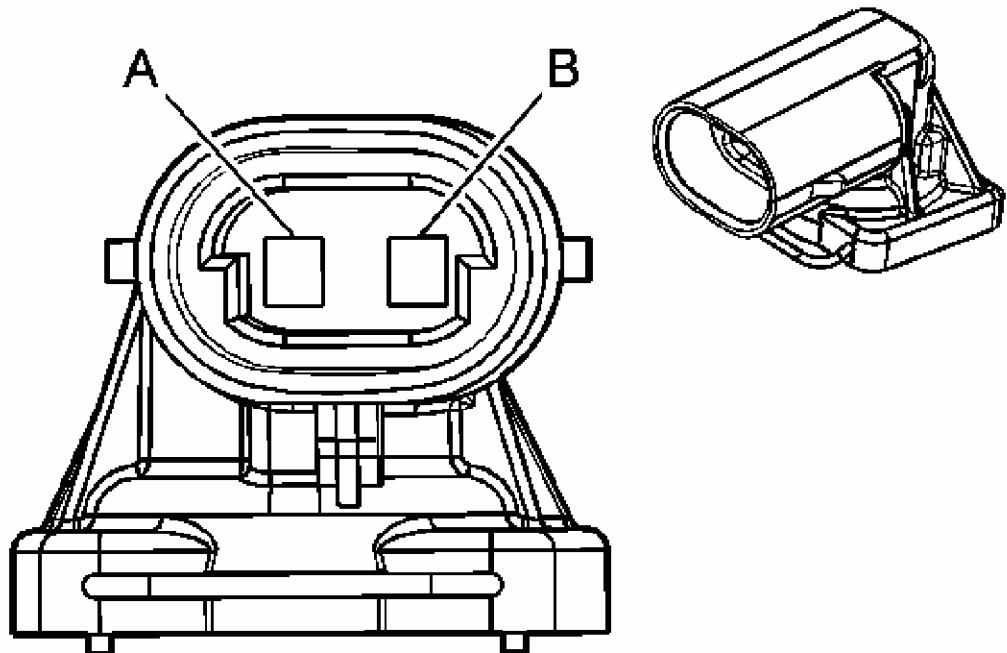
Pin	Wire Color	Circuit No.	Function
A	TN	1006	RF Damper Control
B	D-GN	1009	RF Damper Low Reference

**Suspension Damper - RR (F55)**



**Fig. 10: Suspension Damper - RR (F55 Connector End View**

Courtesy of GENERAL MOTORS CORP.



**Fig. 11: Suspension Damper - RR (F55 Connector End View)**

Courtesy of GENERAL MOTORS CORP.

### Suspension Controls Connector End Views

#### Connector Part Information

- OEM: 15305168
- Service: 12167117
- Description: 2-Way F Metri-Pack 150 Series (GY)
- Suspension Damper Adapter
- OEM: 15359261
- Service: 88953232
- 2-Way M Metri-Pack 150 Series (GY)

#### Terminal Part Information

- Terminal/Tray: 12048074/2
- Core/Insulation Crimp: E/1
- Release Tool/Test Probe: 12094429/J-35616-2A (GY)

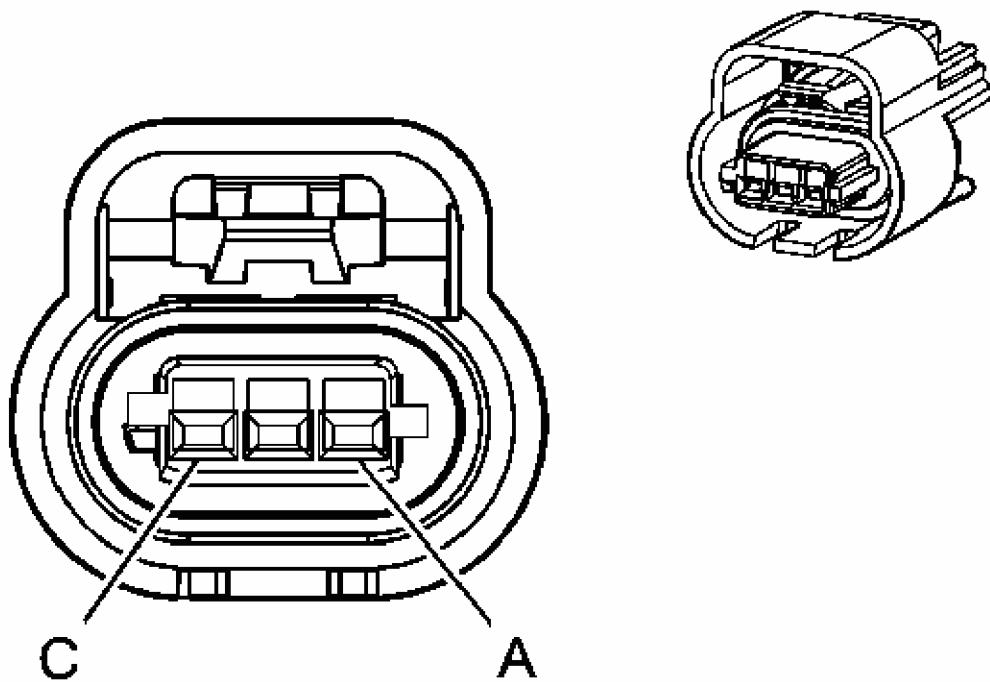
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### Suspension Damper - RR (F55)

Pin	Wire Color	Circuit No.	Function
A	YE/BK	1014	RR Damper Control
B	PU	1017	RR Damper Low Reference

### Suspension Position Sensor - LF (F55)



**Fig. 12: Suspension Position Sensor - LF (F55) Connector End View**  
Courtesy of GENERAL MOTORS CORP.

### Suspension Controls Connector End Views

#### Connector Part Information

- OEM: 15326556
- Service: 88953359
- Description: 3-Way F GT 150 Series (BK)

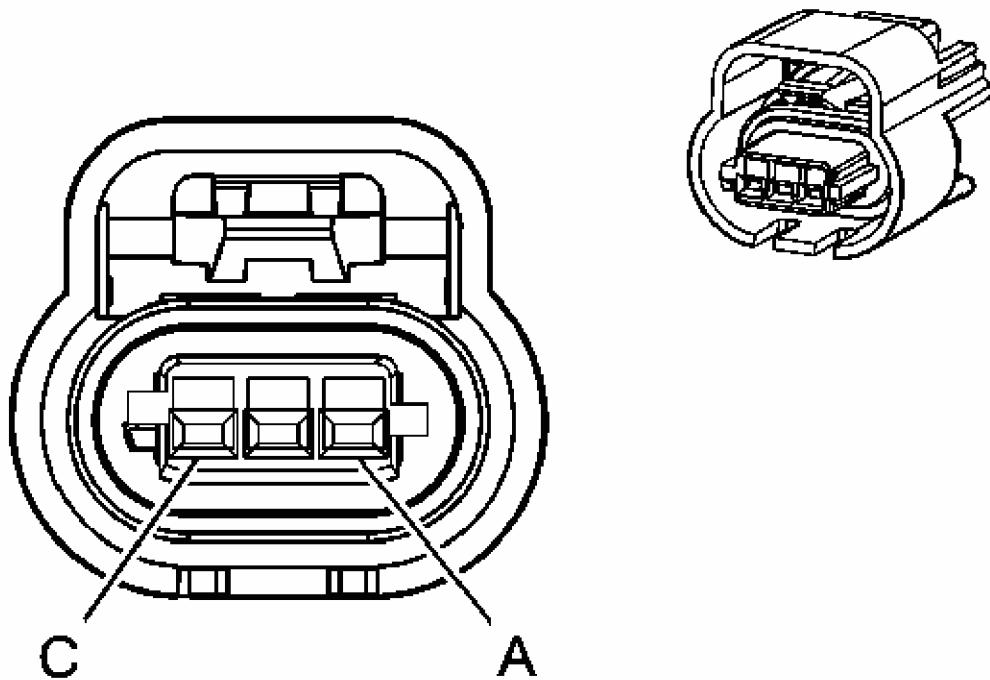
#### Terminal Part Information

- Terminal/Tray: 15326267/19

- **Connector Part Information**
- **Information/Test Probe:** 15315247/J-35616-2A (GY)

**Suspension Position Sensor - LF (F55)**

Pin	Wire Color	Circuit No.	Function
A	PU/WH	1205	LF Suspension Position Sensor Voltage Reference
B	TN/WH	1207	Left Front Suspension Position Sensor Signal
C	L-BU/BK	1206	LF Suspension Position Sensor Low Reference

**Suspension Position Sensor - LR (F55)**

**Fig. 13: Suspension Position Sensor - LR (F55) Connector End View**  
Courtesy of GENERAL MOTORS CORP.

**Suspension Controls Connector End Views****Connector Part Information**

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- OEM: 15326556
- Service: 88953359
- Description: 3-Way F GT 150 Series (BK)

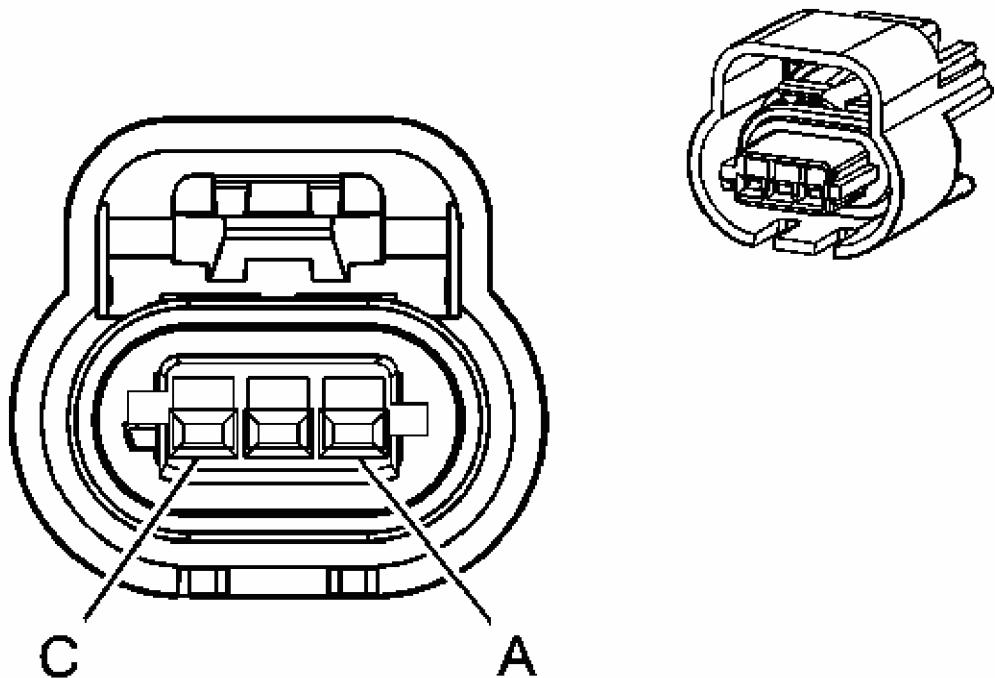
### Terminal Part Information

- Terminal/Tray: 15326267/19
- Core/Insulation Crimp: E/4
- Release Tool/Test Probe: 15315247/J-35616-2A (GY)

### Suspension Position Sensor - LR (F55)

Pin	Wire Color	Circuit No.	Function
A	OG/WH	1208	LR Suspension Position Sensor Voltage Reference
B	L-GN/WH	1210	LR Suspension Position Sensor Signal
C	L-GN/BK	1209	LR Suspension Position Sensor Low Reference

### Suspension Position Sensor - RF (F55)



**Fig. 14: Suspension Position Sensor - RF (F55) Connector End View**  
 Courtesy of GENERAL MOTORS CORP.

### Suspension Controls Connector End Views

#### Connector Part Information

- OEM: 15326556
- Service: 88953359
- Description: 3-Way F GT 150 Series (BK)

#### Terminal Part Information

- Terminal/Tray: 15326267/19
- Core/Insulation Crimp: E/4
- Release Tool/Test Probe: 15315247/J-35616-2A (GY)

### Suspension Position Sensor - RF (F55)

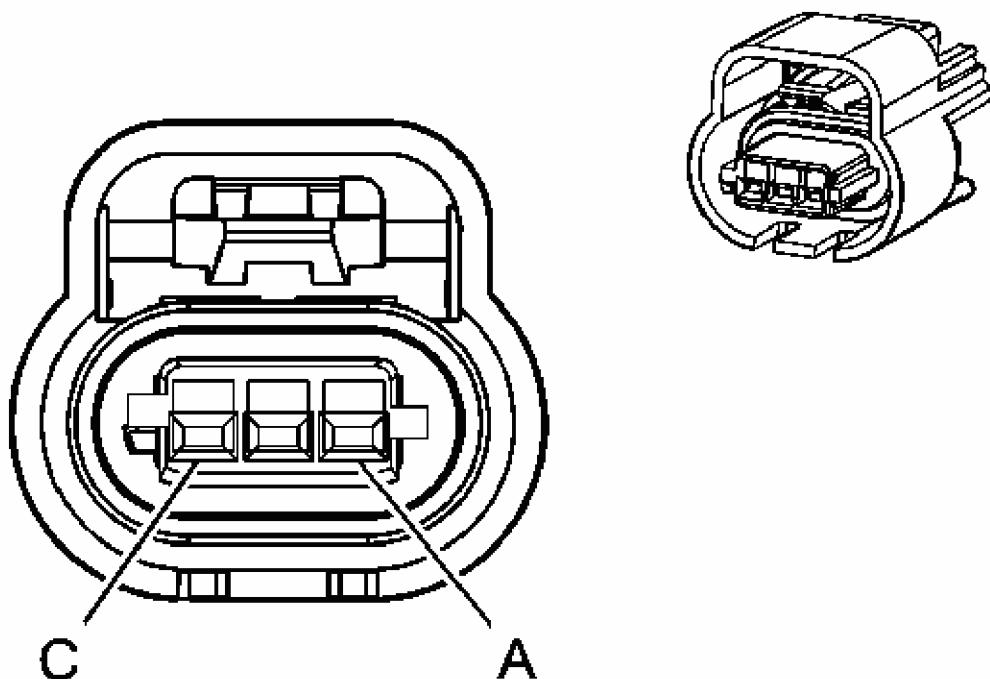
Pin	Wire Color	Circuit No.	Function
A	PU/BK	1211	RF Suspension Position Sensor Voltage Reference

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Pin	Wire Color	Circuit No.	RF Suspension Position Sensor
B	1ND-BU	1213	Signal Suspension Position Sensor
A	PU/BK	1211	RF Stepper Reference Position Sensor Low
C	L-BU/YE	1212	Reference

Suspension Position Sensor - RR (F55)



**Fig. 15: Suspension Position Sensor - RR (F55) Connector End View**

Courtesy of GENERAL MOTORS CORP.

### Suspension Controls Connector End Views

#### Connector Part Information

- OEM: 15326556
- Service: 88953359
- Description: 3-Way F GT 150 Series (BK)

#### Terminal Part Information

- Terminal/Tray: 15326267/19

**Connector Part Information**

- Release Tool/Test Probe: 15315247/J-35616-2A (GY)

**Suspension Position Sensor - RR (F55)**

Pin	Wire Color	Circuit No.	Function
A	TN/OG	1214	RR Suspension Position Sensor Voltage Reference
B	GY/BN	1216	RR Suspension Position Sensor Signal
C	TN/D-GN	1215	RR Suspension Position Sensor Low Reference

**DIAGNOSTIC INFORMATION AND PROCEDURES****DIAGNOSTIC CODE INDEX**

DTC	Description
<u><a href="#">DTC C0558</a></u>	Calibration Data Not Programmed
<u><a href="#">DTC C0575, C0580, C0585 or C0590</a></u>	** MULTIPLE VALUES **
<u><a href="#">DTC C0615, C0620, C0625 or C0630</a></u>	** MULTIPLE VALUES **
<u><a href="#">DTC C0696</a></u>	Position Sensor Overcurrent (5-volt supply)
<u><a href="#">DTC C0895</a></u>	Device Voltage

**DIAGNOSTIC STARTING POINT - ELECTRONIC SUSPENSION CONTROL**

Begin the system diagnosis with [Diagnostic System Check - Vehicle](#) . The Diagnostic System Check will provide the following information:

- The identification of the control modules which command the system.
- The ability of the control modules to communicate through the serial data circuit.
- The identification of any stored diagnostic trouble codes (DTCs) and their status.

The use of the Diagnostic System Check will identify the correct procedure for diagnosing the system and where the procedure is located.

**SCAN TOOL OUTPUT CONTROLS**

A scan tool may be used in order to command the shock absorbers ON or OFF, without the

need for input information from other components. This can be very helpful in determining if a certain portion of a circuit or a component is in working order. The table below lists the tests that are available for the electronic suspension control system. The tests are listed in alphabetical order.

Using a scan tool, select the ESC Special Functions from the scan tool menu. The status of the output being cycled will be shown on the scan tool's display screen. The shock absorbers can be cycled to turn ON or OFF by selecting ESC Special Functions on the scan tool.

Using the LF shock absorber as an example, commanding the LF shock absorber ON can indicate whether the ESC system is able to correctly operate the LF shock absorber. This can determine if a DTC that pertains to that shock absorber is able to reset and if the ESC module's internal circuitry is able to operate the LF shock absorber. For example, suppose the ESC system sets an intermittent DTC C0577, which is LF Shock Absorber Solenoid Short to Ground. In order to diagnose this condition using a scan tool, select the ESC special Functions. Then, cycle the LF shock absorber solenoid while moving the suspected wiring/connector. Attempt to duplicate the malfunction conditions. This scan tool feature allows checks that could not be performed while driving the vehicle. This example can be applied to the other shock absorbers.

### Suspension Control Module

Scan Tool Output Control	Additional Menu Selection(s)	Description
All Command	-	Commands the shock solenoids ON and OFF.
LF Damper Actuator Command	-	Commands the left front shock solenoid ON and OFF.
LR Damper Actuator Command	-	Commands the left rear shock solenoid ON and OFF.
RF Damper Actuator Command	-	Commands the right front shock solenoid ON and OFF.
RR Damper Actuator Command	-	Commands the right rear shock solenoid ON and OFF.

### SCAN TOOL DATA LIST

The ESC Scan Tool Data List contains all the electronic suspension control system related parameters that are available on the scan tool. The parameters in the list are arranged in alphabetical order. The column, "Data List," indicates the location of the parameter within the scan tool menu selections.

Use the ESC Scan Tool Data List as directed by a diagnostic table or in order to supplement the diagnostic procedures. Begin all of the diagnostic procedures with the Vehicle Diagnostic System Check.

Use the ESC Scan Tool Data List only after the following is determined:

- There is no published DTC procedure nor published symptom procedure for the customer concern.
- The DTC or symptom diagnostic procedure indicated by the diagnostic system check does not resolve the customer concern.

The Typical Data Values are obtained from a properly operating vehicle under the conditions specified in the first row of the Scan Tool Data List table. Comparison of the parameter values from the suspect vehicle with the Typical Data Values may reveal the source of the customer concern.

A scan tool must be used in diagnosing system malfunctions before removing or replacing any of the components. Become familiar with the scan tool diagnostic capabilities and thoroughly understand each of the diagnostic features described before attempting any diagnostic procedures. The scan tool is capable of displaying data and input/output information from all of the systems connected to the serial data line. The scan tool is also capable of commanding the shock absorbers ON or OFF without the need for any input information.

#### **Data Display**

The scan tools input display function can be helpful in determining if the ESC module is receiving the correct input status. This can assist in determining if the ESC system is actually operating normally. For example, the ESC system requires the input from the position sensors in order to determine the ride settings. A starting point might be to select the LF position sensor data display function from the scan tool menu. The voltage status should change when the LF corner of the car is pressed down and released. If no change occurred, then the problem is possibly a disconnected link or a stuck sensor. If change did occur, then the problem is intermittent. In order to diagnose this condition using a scan tool, watch the data display for the LF position sensor while moving the suspected wiring/connector. Try to duplicate the malfunction conditions. This scan tool feature allows checks that could not be performed while driving the vehicle.

#### **ESC Scan Tool Data List**

Scan Tool Parameter	Data List	Units Displayed	Typical Data Value
<b>Turn the Ignition ON, Engine OFF/Vehicle Trim Height within Specifications</b>			
Battery Voltage Signal	-	Volts	B+
LF Damper Actuator Command	-	0-100%	0-90%

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Scan Tool Parameter	Data List	Units Displayed	Typical Value
LF Position Sensor	-	0-5 Volts	1.5-3.5 Volts
LR Damper Actuator Command	0-100%	0-100%	0-90%
Command the Ignition ON, Engine OFF/Vehicle Trim Height within Specifications	Trim Height within Specifications		
Battery Voltage Signal	--	0-5 Volts	1.5-3.5 Volts
RF Damper Actuator Command	--	0-100%	0-90%
RF Position Sensor	-	0-5 Volts	1.5-3.5 Volts
RR Damper Actuator Command	-	0-100%	0-90%
RR Position Sensor	-	0-5 Volts	1.5-3.5 Volts
Vehicle Speed	-	km/h (mph)	Varies

### SCAN TOOL DATA DEFINITIONS

#### ESC Scan Tool Data Definitions

The ESC Scan Tool Data Definitions contain a brief description of all the scan tool parameters. This list is in alphanumeric order.

#### Battery Voltage Signal

The scan tool displays 0-26.0 volts. The battery voltage represents the system voltage measured at the controller battery input.

#### LF Damper Actuator Command

The scan tool displays 0-100%. This percentage represents the commanded state of the shock absorber solenoid. When the ESC special functions is selected on the scan tool menu and the left front shock solenoid is commanded ON, the percentage will increase. When the left front shock solenoid is commanded OFF, the percentage will decrease.

#### LF Position Sensor

The scan tool displays 0-5.0 volts. The position sensor is a variable resistor which changes with vehicle trim height. The ESC system uses this voltage reading to determine different road and driving conditions. The ESC system adjusts the damping level in each shock absorber based upon the voltage level received back from all 4 position sensors.

#### LR Damper Actuator Command

The scan tool displays 0-100%. This percentage represents the commanded state of the shock absorbers. When the ESC system commands the shock absorbers ON, the percentage will increase. When the ESC system commands the shock absorbers OFF, the percentage will decrease.

## **LR Position Sensor**

The scan tool displays 0-5.0 volts. The position sensor is a variable resistor which changes with vehicle trim height. The ESC system uses this voltage reading to determine different road and driving conditions. The ESC system adjusts the damping level in each shock absorber based upon the voltage level received back from all 4 position sensors.

## **RF Damper Actuator Command**

The scan tool displays 0-100%. This percentage represents the commanded state of the shock absorber solenoid. When the ESC special functions is selected on the scan tool menu and the right front shock solenoid is commanded ON, the percentage will increase. When the right front shock solenoid is commanded OFF, the percentage will decrease.

## **RF Position Sensor**

The scan tool displays 0-5.0 volts. The position sensor is a variable resistor which changes with vehicle trim height. The ESC system uses this voltage reading to determine different road and driving conditions. The ESC system adjusts the damping level in each shock absorber based upon the voltage level received back from all four position sensors.

## **RR Damper Actuator Command**

The scan tool displays 0-100%. This percentage represents the commanded state of the shock absorber solenoid. When the ESC special functions is selected on the scan tool menu and the right rear shock solenoid is commanded ON, the percentage will increase. When the right rear shock solenoid is commanded OFF, the percentage will decrease.

## **RR Position Sensor**

The scan tool displays 0-5.0 volts. The position sensor is a variable resistor which changes with vehicle trim height. The ESC system uses this voltage reading to determine different road and driving conditions. The ESC system adjusts the damping level in each shock absorber based upon the voltage level received back from all four position sensors.

## **Vehicle Speed**

The scan tool displays 0-255 km/h (0-159 mph). The ESC system obtains vehicle speed data from the PCM on a dedicated input. The PCM is responsible for calculating correct vehicle speed data.

## **DTC C0558**

### **Circuit Description**

The electronic suspension control (ESC) module performs checks of internal calibration data. If a fault condition is detected, the ESC module will set the fault DTC and may, depending upon the fault type, turn ON the SERVICE SUSPENSION SYSTEM message. Recovery from any controller fault condition is attempted only after the ignition is cycled ON and OFF.

**DTC Descriptor**

This diagnostic procedure supports the following DTC:

DTC C0558 Calibration Data Not Programmed

This vehicle has DTCs which include DTC Symptoms. For more information on DTC Symptoms, refer to **DTC Symptom Description**.

**DTC C0558**

<b>DTC Symptom</b>	<b>DTC Symptom Descriptor</b>
4A	Check sum error

**Conditions for Running the DTC**

The ignition is ON.

**Conditions for Setting the DTC**

- The DTC is set when any calibration faults internal to the ESC module are detected.
- The fault is detected during 3 consecutive ignition cycles or during the same ignition cycle after clearing the DTC with the scan tool.

**Action Taken When the DTC Sets**

- Disable all functionality.
- Sends a message to the instrument panel cluster (IPC) to display the SERVICE SUSPENSION SYSTEM message.

**Conditions for Clearing the MIL/DTC**

- The scan tool can be used to clear the DTC.
- The DTC is saved as HISTORY when the ESC module no longer senses the hardware fault and the ignition is cycled OFF and ON.

**Test Description**

The number below refers to the step number on the diagnostic table.

**2:** This step checks to see if the problem has cleared after the ESC module has been

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calibrated.

### DTC C0558

Step	Action	Yes	No
1	Did you perform the Diagnostic System Check - Vehicle?	Go to Step 2	<u>Go to</u> <u>Diagnostic</u> <u>System Check -</u> <u>Vehicle</u>
2	1. Install the scan tool. 2. Turn ON the ignition, with the engine OFF. 3. Calibrate the electronic suspension control (ESC) module using the scan tool. 4. Use the scan tool to clear the DTCs. 5. Operate the vehicle within the Conditions for Running the DTC as specified in the supporting text.		
3	Does the DTC reset? Replace the ESC module. Refer to <b>Control Module References</b> for replacement, setup and programming. Did you complete the replacement?	Go to Step 3	System OK
4	1. Use the scan tool in order to clear the DTCs. 2. Operate the vehicle within the Conditions for Running the DTC as specified in the supporting text.	Go to Step 4	-
	Does the DTC reset?	Go to Step 2	System OK

### DTC C0575, C0580, C0585 OR C0590

#### DTC Descriptors

### DTC C0575

Left Front Actuator Circuit

### DTC C0580

Right Front Actuator Circuit

**DTC C0585**

Left Rear Actuator Circuit

**DTC C0590**

Right Rear Actuator Circuit

This vehicle has DTCs which include DTC Symptoms. For more information on DTC Symptoms, refer to **DTC Symptom Description**.

**DTC C0575, C0580, C0585 or C0590**

<b>DTC Symptom</b>	<b>DTC Symptom Descriptor</b>
01	Short To Battery
02	Short To Ground
04	Open Circuit

**Diagnostic Fault Information**

Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.

**Circuit/System Description**

The electronic suspension control module (ESCM) commands variable levels of pulse width modulated current to each damper in response to rough road or abrupt steering maneuver driving conditions. The ESCM continuously compares each dampers command state with the state of their feedback circuits to ensure they agree.

**Conditions for Running the DTC**

The ignition is ON for 30 seconds.

**Conditions for Setting the DTC**

The damper coil or the circuits to the coil are shorted to ground, shorted to voltage or open for 3 consecutive ignition ON cycles.

**Action Taken When the DTC Sets**

- A DTC is stored in memory.
- The driver information center (DIC) displays the SERVICE SUSPENSION SYS message.
- If DTC symptom 01 is stored the Electronic Suspension Control (ESC) System is

disabled.

- If DTC symptom 02 or 04 is stored the suspect damper is disabled.

**Conditions for Clearing the DTC**

- A current DTC will clear on the next consecutive malfunction-free ignition cycle.
- A history DTC will clear after 50 consecutive malfunction-free ignition cycles.
- Using a scan tool clears the DTC.

**Diagnostic Aids**

- Before proceeding with the diagnostics, ensure the electrical harness connector at the suspect damper is fully engaged by pushing the harness connector toward the damper. If an audible click is heard or substantial engagement travel is noted, ensure the remaining damper connectors are fully engaged as well.
- When the scan tool is used to clear the DTC, the ESCM ignition cycle counter is disabled for the remainder of the ignition cycle. This allows the DTC to set upon initial malfunction detection. Once the ignition is cycled, the counter resets to 3.
- The scan tool can be used to command the suspect damper ON and OFF while actuating the suspension and noticing an increase and decrease in damping control.

**Reference Information****Schematic Reference****Suspension Controls Schematics****Connector End View Reference****Suspension Controls Connector End Views****Electrical Information Reference**

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

**Scan Tool Reference****Scan Tool Data List****Circuit/System Verification**

With the scan tool installed, drive the vehicle and monitor the damper actuators response to

rough road or abrupt steering maneuver driving conditions.

#### **Circuit/System Testing**

Note: It is recommended that Component Testing is performed before Circuit Testing when diagnosing damper actuators.

1. With the ignition OFF, disconnect the ESCM connector.
2. With the ignition ON, measure for 0 volts between the damper control circuit or the low reference circuit and ground at the ESCM connector.
  - If over 0 volts, repair the short to voltage in the damper control circuit or the low reference circuit.
3. With the ignition OFF, measure for infinite ohms of resistance between the damper control circuit or the low reference circuit and ground at the ESCM connector.
  - If less than infinite ohms, repair the short to ground in the damper control circuit or the low reference circuit.
4. Measure for 0.5-2 ohms of resistance between the damper control circuit and low reference circuit at the ESCM connector with the damper actuator connected.
  - If greater than 0.5-2 ohms, check for an open/high resistance in the circuit or faulty damper actuator.
  - If less than 0.5-2 ohms, check for a short between the circuits or faulty damper actuator.
5. If all circuits test normal, replace the ESCM.

#### **Component Testing**

Disconnect the suspect damper actuator harness connector, with the ignition OFF, measure for 0.5-2 ohms from the male terminal in the center of the damper rod to the damper rod.

- If value is not in range, replace the damper.

#### **Repair Procedures**

**IMPORTANT: Always perform the Diagnostic Repair Verification after completing the diagnostic procedure.**

- **Shock Absorber Replacement**
- **Control Module References** for ESCM replacement, setup and programming

**DTC C0615, C0620, C0625 OR C0630**

#### **Circuit Description**

The electronic suspension control (ESC) module supplies a 5-volt reference signal to the suspension position sensor. The suspension position sensor supplies an analog voltage (0.35-4.75 volts) back to the ESC module which represents the position between the body and the wheel. The sensor is also grounded through the ESC module.

#### **DTC Descriptors**

This diagnostic procedure supports the following DTCs:

- DTC C0615 Left Front Position Sensor Circuit
- DTC C0620 Right Front Position Sensor Circuit
- DTC C0625 Left Rear Position Sensor Circuit
- DTC C0630 Right Rear Position Sensor Circuit

This vehicle has DTCs which include DTC Symptoms. For more information on DTC Symptoms, refer to [\*\*DTC Symptom Description\*\*](#).

#### **DTC C0615, C0620, C0625 or C0630**

<b>DTC Symptom</b>	<b>DTC Symptom Descriptor</b>
08	Signal Invalid
55	Expected Number of Transitions Not Reached

#### **Conditions for Running the DTC**

The ignition is ON.

#### **Conditions for Setting the DTC**

- The DTC is set when the ESC module measures the position sensor signal voltage below 0.35 volt or above 4.75 volts for more than 1 second while the vehicle is operated under normal driving conditions.
- The fault is detected during 3 consecutive ignition cycles or during the same ignition cycle after clearing the DTC with a scan tool.

#### **Action Taken When the DTC Sets**

- The ESC module will enter the speed dependent damping mode.
- Both left and right normal force outputs will be set to the default output states.
- The SERVICE SUSPENSION SYS message will be displayed.

#### **Conditions for Clearing the MIL/DTC**

- The scan tool can be used to clear the DTC.
- The DTC is saved as history when the ESC module no longer sees voltage outside the

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normal range. The DTC will clear if the fault does not return during 50 consecutive ignition cycles.

### Diagnostic Aids

- If this fault condition is set along with DTC C0696, diagnose DTC C0696 first.
- If the DTC is a history DTC, the fault may be intermittent. Refer to **Testing for Intermittent Conditions and Poor Connections**.

### Test Description

The numbers below refer to the step numbers on the diagnostic table.

**3:** This step tests for the proper operation of the circuit in the low voltage range.

**4:** This step tests for a short to voltage in the 5-volt reference circuit.

**5:** This step tests for the proper operation of the circuit in the high voltage range. If the fuse in the jumper opens when you perform this test, the signal circuit is shorted to ground.

**7:** This step tests for a high resistance or an open in the ground circuit.

### DTC C0615, C0620, C0625 or C0630

Step	Action	Value(s)	Yes	No
<b>Schematic Reference: <u>Suspension Controls Schematics</u></b>				
1	Did you perform the Diagnostic System Check - Vehicle?	-		Go to <b><u>Diagnostic System Check - Vehicle</u></b>
2	1. Install a scan tool. 2. Turn ON the ignition, with the engine OFF. 3. With the scan tool, observe the position sensor data parameter in the electronic suspension control (ESC) module data list.  Does the scan tool indicate that the position sensor data parameter is within the specified range?	0.35-4.75 V		
	1. Turn OFF the ignition.		Go to <b>Diagnostic Aids</b>	Go to <b>Step 3</b>

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3	<p>2. Disconnect the position sensor.</p> <p>3. Turn ON the ignition, with the engine OFF.</p> <p>4. With a scan tool, observe the position sensor data parameter.</p> <p>Does the scan tool indicate that the position sensor data parameter is less than the specified value?</p> <p>Measure the voltage between the 5-volt reference circuit of the position sensor and a good ground.</p>	0.35 V	Go to Step 4	Go to Step 8
4	<p>Does the voltage measure near the specified value?</p> <ol style="list-style-type: none"> <li>1. Turn OFF the ignition.</li> <li>2. Connect a 3-amp fused jumper wire between the 5-volt reference circuit of the position sensor and the signal circuit of the position sensor.</li> </ol>	5 V	Go to Step 5	Go to Step 6
5	<p>3. Turn ON the ignition, with the engine OFF.</p> <p>4. With a scan tool, observe the position sensor data parameter.</p> <p>Does the scan tool indicate that the position sensor data parameter is greater than the specified value?</p>	4.75 V		
6	<p>Does the voltage measure greater than the specified value?</p> <ol style="list-style-type: none"> <li>1. Disconnect the fused jumper wire.</li> <li>2. Measure the voltage between the 5-volt reference</li> </ol>	5.625 V	Go to Step 7	Go to Step 9
			Go to Step 10	Go to Step 11

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Step	circuit of the <u>height</u> position sensor	Value(s)	Yes	No
<b>Schematic</b>	<b>Reference: Suspension Controls</b>	<b>Schematics</b>		
7	Did you perform the Diagnostic System Check - Vehicle?	3.75 V		Go to <u>Diagnostic System Check - Vehicle</u>
1	Does the voltage measure less than the specified value?	-	Go to Step 12 Go to Step 2	Go to Step 13
8	Test the signal circuit of the position sensor for a short to voltage. Refer to <u>Circuit Testing and Wiring Repairs</u> . Did you find and correct the condition?	-	Go to Step 17	Go to Step 14
2	Test the signal circuit of the electronic suspension control (ESC) ground lug for a short to ground, high resistance or an open. Refer to <u>Circuit Testing and Wiring Repairs</u> . Did you find and correct the condition?	0.35-4.75 V		
9	Test the 5-volt reference circuit of the position sensor for a short to ground. Turn ON the ignition with the engine OFF. Did you find and correct the condition?	-	Go to Diagnostic Aids	Go to Step 14
10	Test the 5-volt reference circuit of the position sensor for a short to ground. Refer to <u>Circuit Testing and Wiring Repairs</u> . Did you find and correct the condition?	-	Go to Step 17	Go to Step 14
3	With a scan tool, observe the position sensor data parameter for a short to ground, high resistance or an open. Refer to <u>Circuit Testing and Wiring Repairs</u> . Does the scan tool indicate that the position sensor data parameter is less than the specified value?	0.35 V		
11	Measure the voltage between the 5-volt reference circuit of the position sensor and a good ground. Does the voltage measure near the specified value?	-	Go to Step 17 Go to Step 4	Go to Step 14
4	Test the low reference circuit of the position sensor for high resistance or an open. Refer to <u>Circuit Testing and Wiring Repairs</u> . Did you find and correct the condition?	5 V		
12	Inspect for poor connections at the harness connector of the	-	Go to Step 5	Go to Step 14
			Go to Step 17	Go to Step 14

	position sensor. Refer to <b>Testing for Intermittent Conditions and Poor Connections and Connector Repairs</b> . 1. Turn OFF the ignition. 2. Connect a 5-amp fused jumper wire between the 5-volt reference circuit of the position sensor and the signal circuit of the position sensor. 3. Turn ON the ignition with the engine OFF. 4. With a scan tool, observe the position sensor data parameter.	-	Go to Step 17	Go to Step 15
13	Did you find and correct the circuit of the position sensor? Inspect for poor connections at the harness connector of the ESC module. Refer to <b>Testing for Intermittent Conditions and Poor Connections and Connector Repairs</b> .	4.75 V	-	Go to Step 15
14	Did you find and correct the position sensor data parameter? Replace the position sensor. Refer to <b>Electronic Suspension Front Position Sensor Replacement</b> or <b>Electronic Suspension Rear Position Sensor Replacement</b> . 1. Disconnect the fused jumper wire. 2. Measure the voltage between the 5-volt reference. Refer to <b>Control Module References</b> for replacement equipment of the position sensor.	-	Go to Step 17	Go to Step 16
6	Does the voltage measure greater than the specified value?	5.625 V	Go to Step 10	Go to Step 11
15	Did you complete the replacement? Replace the vehicle. Refer to <b>Circuit Testing and Wiring Repairs</b> and the <b>DTC</b> as specified in the supporting text?	-	Go to Step 17	-
7	Did you complete the replacement? Does the voltage measure less than the specified value?	3.75 V	-	-
16	Did you complete the replacement? Does the voltage measure less than the specified value?	-	Go to Step 12	Go to Step 13
17	1. Use the scan tool in order to Test the signal circuit of the position sensor for a short to ground. 2. Operate the vehicle within the voltage. Refer to <b>Circuit Testing and Wiring Repairs</b> and the <b>DTC</b> as specified in the supporting text?	-	Go to Step 17	Go to Step 14
	Test the signal circuit of the position sensor. Does the <b>DTC</b> reset?	-	Go to Step 2	System OK

**DTC C0696****Circuit Description**

The electronic suspension control (ESC) module provides a common regulated power supply of about 5 volts to all of the position sensors. The ESC module monitors this power supply for

a malfunction that could prevent it from correctly regulating the supply voltage.

**DTC Descriptor**

This diagnostic procedure supports the following DTC:

DTC C0696 Position Sensor Overcurrent (5-volt supply)

This vehicle has DTCs which include DTC Symptoms. For more information on DTC Symptoms, refer to **DTC Symptom Description**.

**DTC C0696**

<b>DTC Symptom</b>	<b>DTC Symptom Descriptor</b>
00	No additional information

**Conditions for Running the DTC**

The ignition is ON.

**Conditions for Setting the DTC**

- The ESC module senses position sensor supply voltage under 4.5 volts or over 5.5 volts.
- The condition must be detected for 1 second in 4 consecutive ignition cycles.

**Action Taken When the DTC Sets**

- Stores a DTC C0696 in the ESC memory
- Command speed dependent damping system default AND command normal force signals to default state.
- Sends a message to the instrument panel cluster (IPC) to display the SERVICE SUSPENSION SYSTEM message

**Conditions for Clearing the DTC**

- A history DTC will clear after 100 consecutive ignition cycles if the condition for the malfunction is no longer present.
- The ESC module senses the correct sensor supply voltage (4.5-5.5 volts).
- The IPC clearing DTCs feature
- Using a scan tool

**Diagnostic Aids**

- The following conditions may cause an intermittent malfunction to occur:
  - An intermittent short to ground is detected on any of the position sensor supply

circuits.

- An intermittent short to voltage is detected on any of the position sensor supply circuits.
- The ESC module uses a common power supply in order to provide voltage to all of the position sensors. Therefore, a position sensor overcurrent code may be set if a malfunction is detected on any position sensor supply circuit.
- The ESC module uses an ignition cycle counter diagnostic approach to set this DTC. This requires the ESC module to detect the malfunction 4 times before setting the DTC. To disable this feature, use a scan tool to clear all DTCs before performing diagnostic procedures.
- If any position sensor supply circuit is shorted to ground, the scan tool will indicate all of the position sensor voltage readings as zero.
- If any position sensor is shorted to voltage, the position sensor will still function properly and the scan tool will display a valid position sensor voltage reading.
- An intermittent DTC C0696 may produce a random firm/soft condition.

#### Test Description

The numbers below refer to the step numbers on the diagnostic table.

**2:** This step tests the position sensor signal voltage range using a scan tool. The scan tool will display 0 volts for all position sensors if any position sensor 5-volt reference circuit is shorted to ground.

**3:** This step tests if any position sensor is shorted to ground.

**4:** This step tests determines which position sensor is shorted to ground.

**5:** This step tests for a short to ground in the position sensor 5-volt reference circuits.

**6:** This step tests for a short to voltage in the position sensor 5-volt reference circuits.

#### DTC C0696

Step	Action	Value(s)	Yes	No
<b>Schematic Reference:</b> <a href="#">Suspension Controls Schematics</a>				
<b>Connector End View Reference:</b> <a href="#">Suspension Controls Connector End Views</a>				
1	Did you perform the Diagnostic System Check - Vehicle?	-		Go to <a href="#">Diagnostic System Check - Vehicle</a>
	1. Install a scan tool. 2. Turn ON the ignition, with the engine OFF.		Go to Step 2	

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2	<p>3. With the scan tool, observe all 4 Position Sensor Data parameters in the electronic suspension control (ESC) data list.</p> <p>Does the scan tool indicate that all 4 Position Sensor Data parameters are within the specified range?</p> <ol style="list-style-type: none"> <li>1. Turn OFF the ignition.</li> <li>2. Disconnect all 4 position sensors.</li> <li>3. Turn ON the ignition, with the engine OFF.</li> <li>4. Use the scan tool in order to clear the DTCs.</li> </ol> <p>Does the DTC reset?</p>	1.5-5.5 V	Go to Step 3	Go to Step 6
3		-		
4	<p>Connect each position sensor one at a time and observe if the DTC resets after each sensor is reconnected.</p> <p>Does the DTC reset?</p>	-	Go to Step 7	System OK
5	<p>Test the 5-volt reference circuit of all position sensors for a short to ground. Refer to <b><u>Circuit Testing and Wiring Repairs</u></b>.</p> <p>Did you find and correct the condition?</p>	-	Go to Step 9	Go to Step 8
6	<p>Test the 5-volt reference circuit of all position sensors for a short to voltage. Refer to <b><u>Circuit Testing and Wiring Repairs</u></b>.</p> <p>Did you find and correct the condition?</p>	-	Go to Step 9	Go to Diagnostic Aids
7	<p>Replace the applicable position sensor. Refer to <b><u>Electronic Suspension Front Position Sensor Replacement</u></b> or <b><u>Electronic Suspension Rear Position Sensor Replacement</u></b>.</p>	-		-

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Step	Did you complete the replacement?	Value(s)	Go to <b>Step 9</b>	No
<b>Schematic</b>	<a href="#">Refer to the <b>Suspension Control</b> Schematics</a>			
<b>Connector</b>	<a href="#">Refer to the <b>Vehicle</b> <b>Front View</b> <b>Right</b> <b>Rear</b> <b>Suspension Control</b> Connector End Views</a>			
8	Did you perform the Diagnostic System Check - Vehicle?	-		<a href="#">Go to <b>Diagnostic System Check - Vehicle</b></a>
1	Did you complete the replacement?  1. Use the scan tool in order to clear the DTCs.	-	<a href="#">Go to <b>Step 9</b></a>	<a href="#">Go to <b>Step 2</b></a>
9	2. Operate the vehicle within the conditions for running the DTC as specified in the supporting text.	-		
2	3. With the scan tool, observe all 4 Position Sensor Data Does the DTC reset?	1.5-5.5 V	<a href="#">Go to <b>Step 2</b></a>	System OK

## DTC C0895

### Circuit Description

Voltage is supplied to the electronic suspension control (ESC) module in the battery positive voltage circuit and the ignition voltage circuit. The ESC module monitors the supplied voltage to determine if it is within a valid operating range.

### DTC Descriptor

This diagnostic procedure supports the following DTC:

#### DTC C0895 Device Voltage

This vehicle has DTCs which include DTC Symptoms. For more information on DTC Symptoms, refer to [\*\*DTC Symptom Description\*\*](#) .

## DTC C0895

DTC Symptom	DTC Symptom Descriptor
00	No additional information

### Conditions for Running the DTC

The ignition is ON.

### Conditions for Setting the DTC

The DTC is set when the battery voltage is outside the normal range of 9-15.5 volts.

### Action Taken When the DTC Sets

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Disable all functionality

### Conditions for Clearing the MIL/DTC

- The scan tool can be used to clear the DTC.
- The DTC is saved as history when the ESC module no longer sees battery voltage outside the normal range of 9-15.5 volts. The DTC will clear if the fault does not return after 50 consecutive ignition cycles.

### Diagnostic Aids

DTC C0895 may set when the vehicle is placed on a battery charger, on fast charge, for a long period of time. It may also be set by an intermittent charging system malfunction.

### Test Description

The numbers below refer to the step numbers on the diagnostic table.

1: This test determines whether the malfunction is in the supply voltage or the ESC module.

2: This step checks for high resistance, a short to ground or an open in the battery positive voltage circuit.

### DTC C0895

Step	Action	Value(s)	Yes	No
<b>Schematic Reference:</b> <a href="#">Suspension Controls Schematics</a>				
<b>Connector End View Reference:</b> <a href="#">Suspension Controls Connector End Views</a>				
1	Measure the voltage in the electronic suspension control (ESC) module battery positive voltage circuit. Does the voltage measure within the specified values?	9-15.5 V	Go to Step 3	Go to Step 2
2	Test for high resistance, a short to ground or an open in the battery positive voltage circuit of the ESC module. Refer to <b><a href="#">Circuit Testing and Wiring Repairs</a></b> . Did you find and correct the condition?	-	Go to Step 7	Go to <b><a href="#">Battery Inspection/Test</a></b>
	1. Use the scan tool in order to clear the DTCs.			

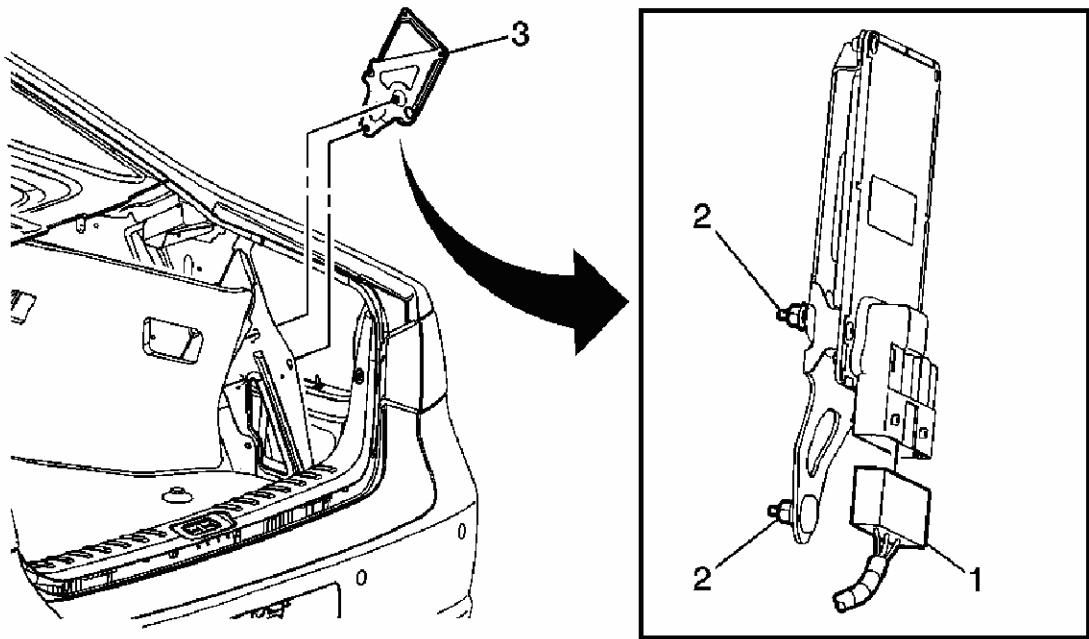
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3	<p>2. Operate the vehicle within the Conditions for Running the DTC as specified in the supporting text.</p> <p>Does the DTC reset? Inspect for poor connections at the harness connector of the ESC module. Refer to <b><u>Testing for Intermittent Conditions and Poor Connections</u></b> and <b><u>Connector Repairs</u></b>.</p> <p>Did you find and correct the condition?</p>	-	Go to <b>Step 4</b>	Go to <b>Step 6</b>
4	<p>Replace the ESC module. Refer to <b><u>Control Module References</u></b> for replacement, setup and programming.</p> <p>Did you complete the replacement?</p>	-	Go to <b>Step 7</b>	Go to <b>Step 5</b>
5	<p>Inspect for poor connections at the harness connector of the ESC module. Refer to <b><u>Testing for Intermittent Conditions and Poor Connections</u></b> and <b><u>Connector Repairs</u></b>.</p> <p>Did you find and correct the condition?</p>	-	Go to <b>Step 7</b>	-
6	<p>Inspect for poor connections at the harness connector of the ESC module. Refer to <b><u>Testing for Intermittent Conditions and Poor Connections</u></b> and <b><u>Connector Repairs</u></b>.</p> <p>Did you find and correct the condition?</p>	-	Go to <b>Step 7</b>	Go to Diagnostic Aids
7	<p>1. Use the scan tool in order to clear the DTCs.</p> <p>2. Operate the vehicle within the Conditions for Running the DTC as specified in the supporting text.</p> <p>Does the DTC reset?</p>	-	Go to <b>Step 2</b>	System OK

## REPAIR INSTRUCTIONS

### ELECTRONIC SUSPENSION CONTROL MODULE REPLACEMENT



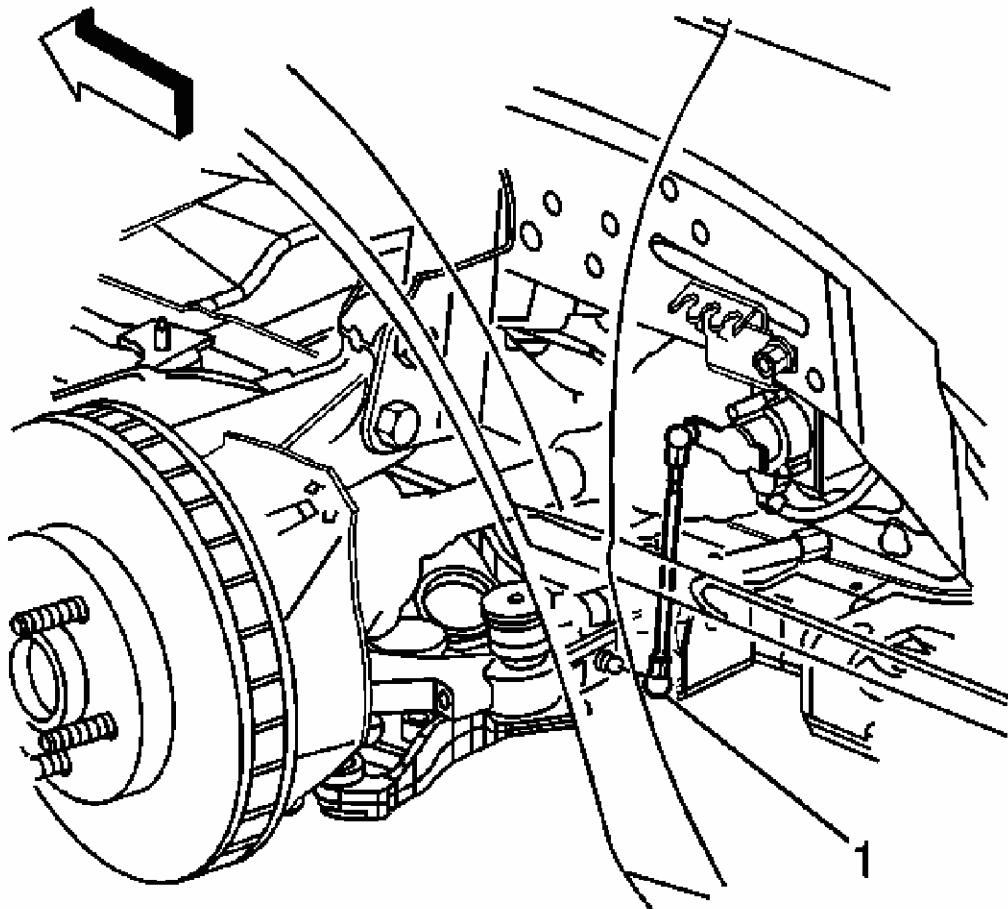
**Fig. 16: Removing/Installing Electronic Suspension Control Module**  
 Courtesy of GENERAL MOTORS CORP.

### Electronic Suspension Control Module Replacement

Callout	Component Name
<b>NOTE:</b>	
Refer to <a href="#">Fastener Notice</a> .	
<b>Fastener Tightening Specifications:</b> Refer to <a href="#">Fastener Tightening Specifications</a> .	
<b>Preliminary Procedures</b>	
1.	Raise and support the vehicle. Refer to <a href="#">Lifting and Jacking the Vehicle</a> .
2.	Remove the tire and wheel. Refer to <a href="#">Tire and Wheel Removal and Installation</a> .
3.	Remove the compartment trim panel. Refer to <a href="#">Rear Compartment Trim Panel Replacement</a> .
1	Electrical Connector
2	Nuts (Qty: 2)
3	Control Module
	<b>Tighten:</b> 9 N.m (80 lb in)

### ELECTRONIC SUSPENSION FRONT POSITION SENSOR REPLACEMENT

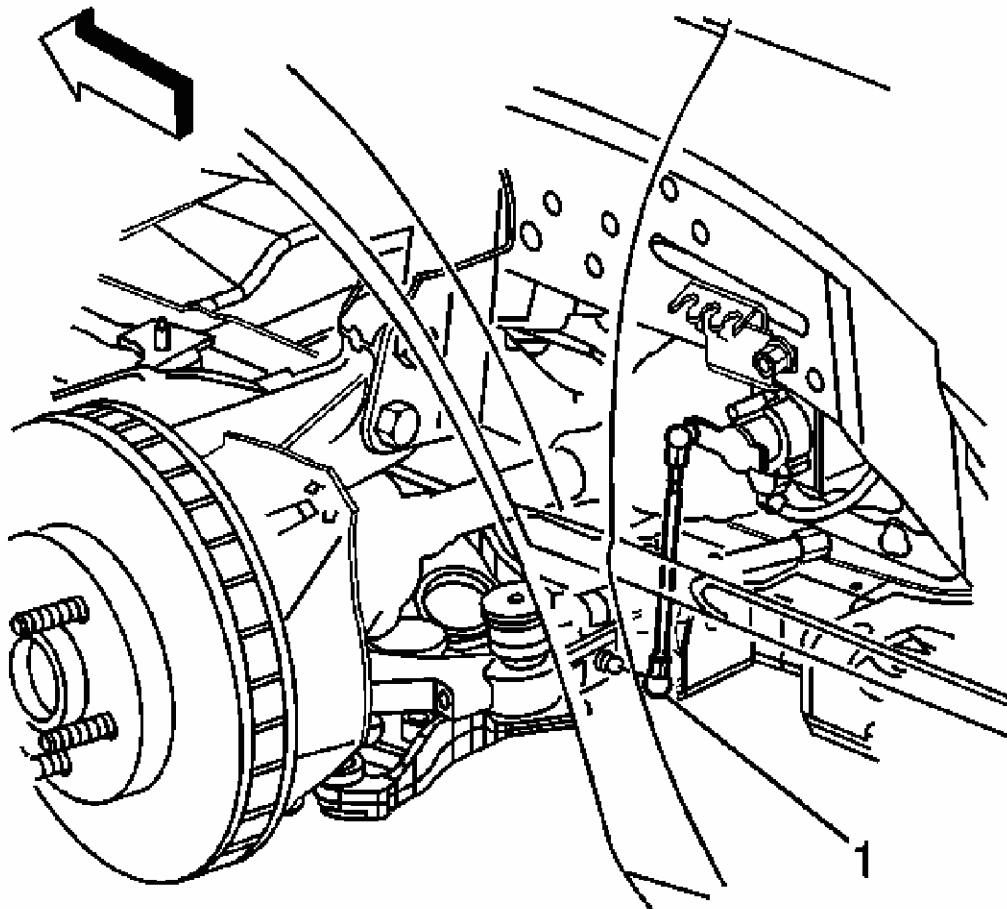
#### Removal Procedure



**Fig. 17: View Of Swnsor Link Ball Stud**  
Courtesy of GENERAL MOTORS CORP.

1. Raise the vehicle. Refer to [Lifting and Jacking the Vehicle](#) .
2. Remove the wheel from the vehicle. Refer to [Tire and Wheel Removal and Installation](#) .
3. Disconnect the height sensor connector.
4. Disconnect the sensor link from the ball stud (1).
5. Loosen the sensor mounting nut.
6. Remove the sensor from the vehicle.

#### Installation Procedure



**Fig. 18: View Of Sensor Link Ball Stud**  
Courtesy of GENERAL MOTORS CORP.

1. Insert head of the sensor mounting stud into the key hole.

**NOTE:** Refer to Fastener Notice .

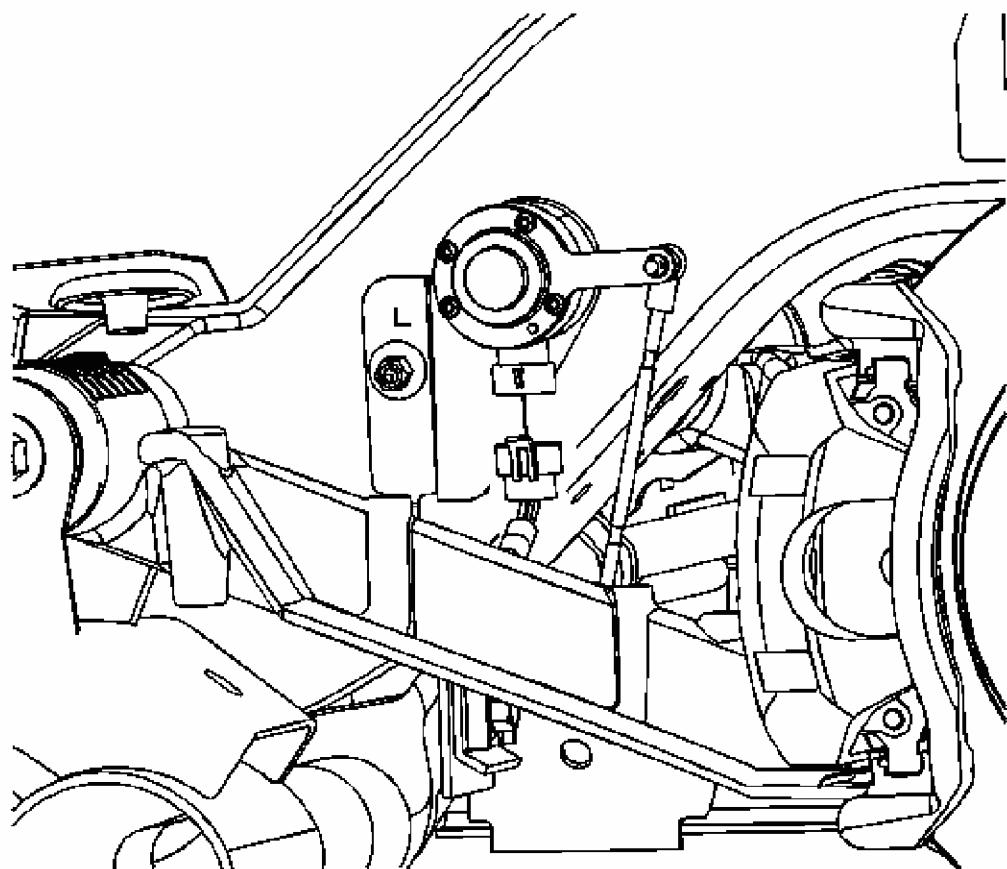
2. Tighten the sensor mounting nut.

**Tighten:** Tighten the nut to 9 N.m (80 lb in).

3. Connect the sensor link on the ball stud (1).
4. Connect the height sensor connector.
5. Install the wheel on the vehicle. Refer to Tire and Wheel Removal and Installation .
6. Lower the vehicle. Refer to Lifting and Jacking the Vehicle .

## ELECTRONIC SUSPENSION REAR POSITION SENSOR REPLACEMENT

### Removal Procedure

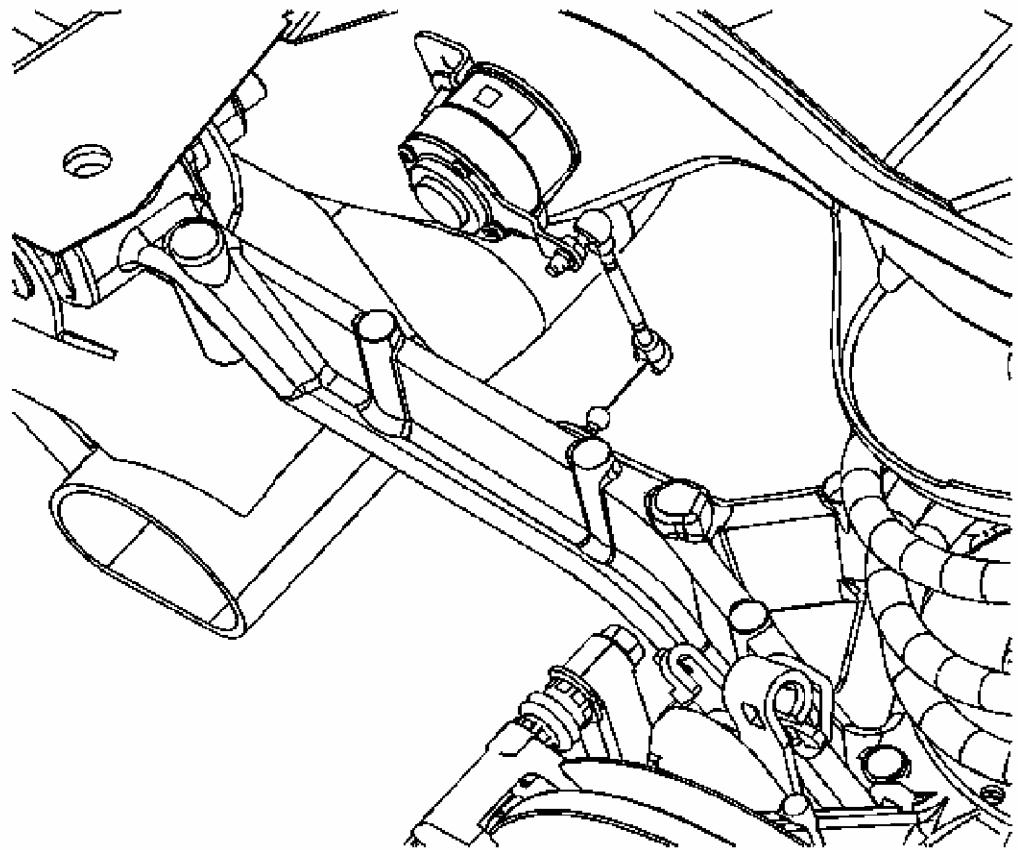


**Fig. 19: Identifying Rear Position Link, Sensor & Connector**  
Courtesy of GENERAL MOTORS CORP.

1. Raise the vehicle. Refer to [Lifting and Jacking the Vehicle](#) .
2. Remove the wheel from the vehicle. Refer to [Tire and Wheel Removal and Installation](#) .
3. Disconnect the height sensor electrical connector.

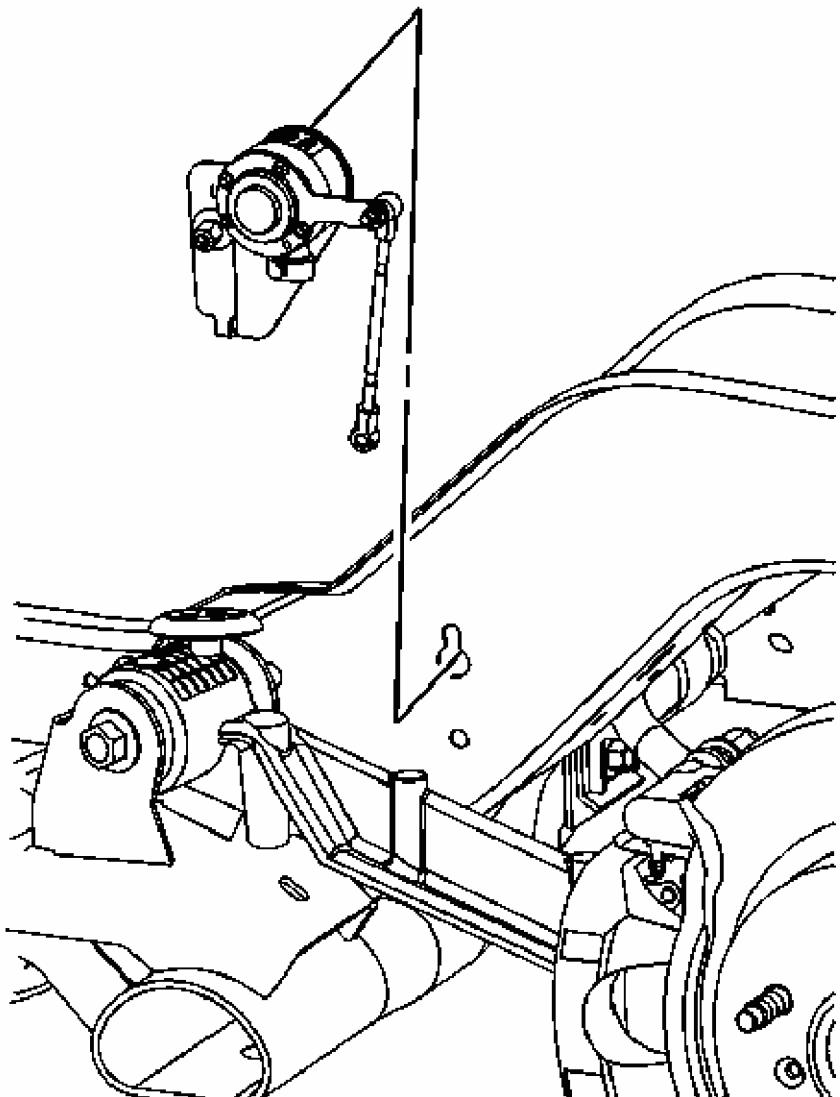
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**Fig. 20: View Of Sensor & Link**  
Courtesy of GENERAL MOTORS CORP.

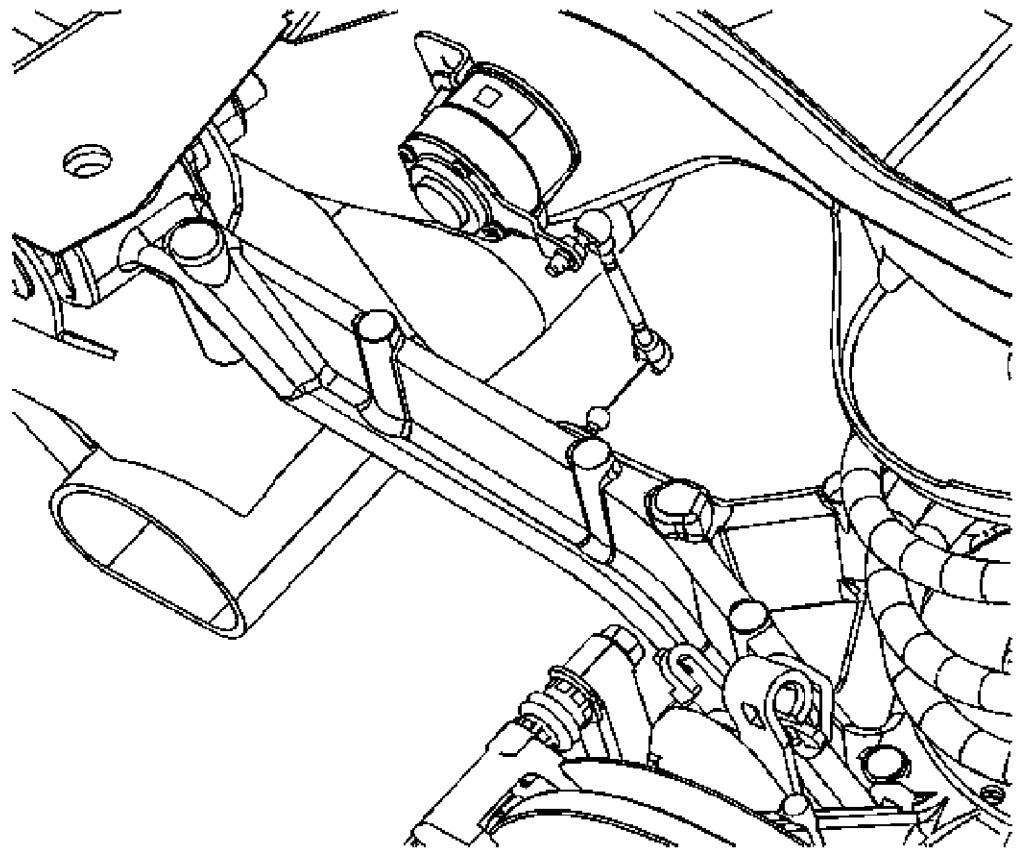
4. Disconnect the sensor link from the ball stud.



**Fig. 21: Removing/Installing Rear Suspension Position Sensor Sensor**  
Courtesy of GENERAL MOTORS CORP.

5. Loosen the sensor mounting nut.
6. Disengage the anti-rotation tab and slide the sensor downward.
7. Remove the sensor from the vehicle.

**Installation Procedure**



**Fig. 22: View Of Sensor & Link**

Courtesy of **GENERAL MOTORS CORP.**

1. Insert head of the sensor mounting stud into the key hole.
2. Slide the sensor upward until the anti-rotation tab engages in the lower hole.

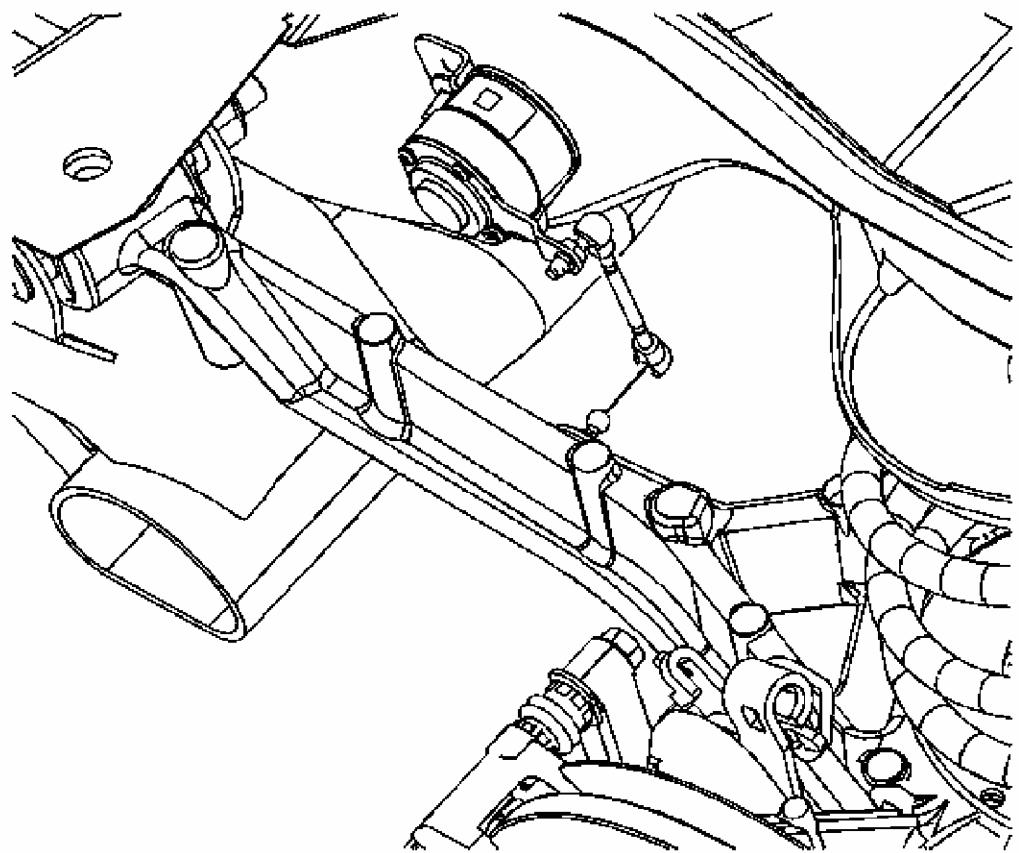
**NOTE: Refer to Fastener Notice .**

3. Tighten the sensor mounting nut.

**Tighten:** Tighten the nut to 9 N.m (80 lb in).

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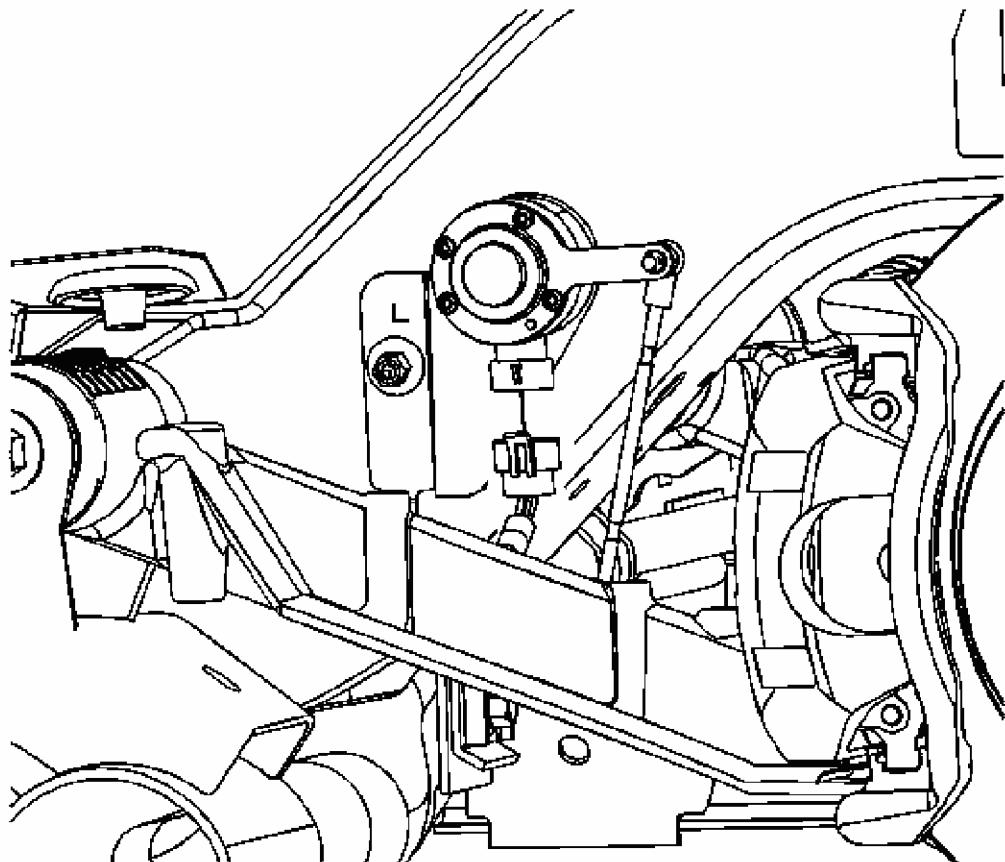
2006 SUSPENSION Electronic Suspension Control (ESC) - Lucerne



**Fig. 23: View Of Sensor & Link**

**Courtesy of GENERAL MOTORS CORP.**

4. Connect the sensor link on the ball stud.



**Fig. 24: Identifying Rear Position Link, Sensor & Connector**  
Courtesy of GENERAL MOTORS CORP.

5. Connect the height sensor electrical connector.
6. Install the wheel on the vehicle. Refer to [Tire and Wheel Removal and Installation](#).
7. Lower the vehicle. Refer to [Lifting and Jacking the Vehicle](#).

## **DESCRIPTION AND OPERATION**

### **ELECTRONIC SUSPENSION CONTROL DESCRIPTION AND OPERATION**

#### **Electronic Suspension Control Description**

The electronic suspension control system, also known as the magneto-rheological real time damping (MRRTD) system independently controls the fluid viscosity in each of the 4 shock absorbers in order to control the vehicle ride characteristics. The electronic suspension control (ESC) system is capable of making these changes within milliseconds. The ESC system

consists of the following major components:

- The ESC module
- The front/rear position sensors
- The front/rear adjustable shock absorbers
- The shock absorber electrical actuators, which are integrated within the shock absorbers

The ESC controls the damping mode selection according to the following factors:

- The vehicle speed
- The chassis pitch input
- The steering position
- The body to wheel displacement

The ESC module evaluates these inputs in order to separately control the shock absorbers, providing an enhanced ride and comfort level over the widest possible range of operating conditions.

#### **Electronic Suspension Control Module**

The electronic suspension control (ESC) module provides electronic control logic and output drive for each shock absorber. The ESC module makes decisions due to road and driving conditions based on various inputs. The ESC module receives input information by sensors that are directly connected to the ESC module or by other systems through the serial data line.

The ESC module uses these inputs in order to independently control the shock absorbers at each corner. The ESC module is located in the LH rear storage.

#### **Electronic Suspension Control Position Sensors**

The electronic suspension control (ESC) position sensors provide the ESC module with the body to wheel displacement input. The ESC module uses this and other inputs in order to control the stiffness of the shock absorber. If any body or wheel motion is detected, the ESC module will determine how soft or firm each shock absorber should be to provide the best ride. The ESC position sensors are mounted at each corner of the vehicle between the control arm and the body.

#### **Electronic Suspension Control Shock Absorber or Strut**

The electronic suspension control (ESC) shock absorbers are monotube type which provide damping by increasing magnetic flux to magnetic particles to resist suspension movement. The ESC shock absorber has the capability of providing multiple modes or values of damping forces, in both compression and rebound direction. The damping forces are achieved by increasing or decreasing the magnetic flux to shock absorbers.

The front ESC actuator connector is located at the top of the shock absorber. The rear ESC actuator connector is at the top of the shock absorber. The rear shock absorbers have jumper harnesses for ease of maintenance.

#### **Electronic Suspension Control Operation**

The electronic suspension control (ESC) system uses the information from other systems in order to execute certain functions.

The ESC system does not have a malfunction indicator lamp, but instead uses the instrument panel cluster (IPC) for the display functions. When the ESC system detects a malfunction that sets a DTC, the ESC system sends a message on the serial data line directly or through the powertrain control module (PCM) to the IPC, which will display one of the following messages:

- SHOCKS INOPERATIVE
- SERVICE RIDE CONTROL
- MAXIMUM SPEED 129 km/h (80 mph)

The SHOCKS INOPERATIVE message will only be displayed if the ESC system detects a malfunction that sets a DTC and causes the ESC system to disable all 4 shock absorbers. The ESC system will send a message on the serial data line to the IPC to display this message.

The SERVICE RIDE CONTROL message will only be displayed if the ESC system detects any malfunction that sets a DTC. The ESC system will send a message on the serial data line to the IPC to display this message.

The MAXIMUM SPEED message will only be displayed if the ESC system detects a malfunction that sets a DTC and causes the ESC system to disable all 4 shock absorbers. The ESC system will send a message on the serial data line to the PCM indicating that all 4 shock absorbers were disabled. The PCM then sends a message to the IPC to display this message.

The ESC module has the ability to store DTCs as current or history codes. Most ESC system malfunctions will display a message in the IPC and set a DTC. The message will remain ON until the RESET button is pressed on the driver information center (DIC). As long as the DTC is current, the message will be displayed after every ignition cycle and the RESET button must be pressed to bypass the message.

The ESC system uses an ignition cycling diagnostic approach in order to reduce the occurrence of false or intermittent DTCs that do not affect the functionality of the ESC system. This allows for the fail-soft actions to be taken whenever a malfunction condition is current, but requires the malfunction to be current for a certain number of ignition cycles before the corresponding malfunction code and message will be stored or displayed.

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If the ESC detects a malfunction, the ESC system defaults with a fail-soft action. A fail-soft action refers to any specific action the ESC system takes in order to compensate for a detected malfunction. A typical ESC fail-soft action would be if the ESC system detects a malfunction with a shock absorber. The ESC system will ignore this input and fail-soft to the TOUR ride setting.

It is possible for a suspension position sensor to become stuck. This fault would not be detected by the ESC module, therefore a DTC would not be set and no message would be displayed by the IPC. Review sensor replacement for proper linkage placement. Refer to **Electronic Suspension Front Position Sensor Replacement** and **Electronic Suspension Rear Position Sensor Replacement**.

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